After-Sales Service · Instructions

Testing

28
VDT-W-280/301 En
Ed. 2
(2.86)

Jetronic Component Testing

Components:

Throttle-valve switch	0 280 120 ...
Thermo-time switch	0 280 130 2 ..
Temperature sensor	0 280 130 ...
Series resistor	0 280 159 ...
Solenoid-op. air valve	0 280 141 ...
Pressure-jump switch	0 280 111 ...
Throttle-valve switch with potentiometer	0 280 120 4 ..

BOSCH Automotive Equipment
After-Sales
Service

This publication has been redesigned with the forth-coming change-over to microfilm in mind.
When a publication has been transferred to microfilm, the screen will be filled completely by a quarter of a printed publication page. For this reason, it is unavoidable that illustrations are repeated in the case of longer texts in which reference is constantly being made to a particular illustration.
Until the change-over to microfilm, we have slightly reduced the size of the print and of the illustrations.

Contents

Automotive Equipment - After-Sales Service
Department for Technical Publications KH/VDT,
Postfach 50, D-7000 Stuttgart 1

Published by: After-Sales Service Department for Training and Technology (KH/VSK). Press date: 12.1985

Please direct questions and comments concerning the contents to our authorized representative in your country.

Printed in the Federal Republic of Germany. Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.

Jetronic component testing

1. Purpose

For the testing of individual electric components of a Jetronic system when removed.

2. Test instructions for

	Coordinate
2.1 Throttle-valve switch (0 280 120 ...)	A 7
2.2 Thermo-time switch (0 280 130 2..)	A 10
2.3 Temperature sensor (0 280 130 ...)	A 14
2.4 Series resistor (0 280 159 ...)	A 17
2.5 Solenoid-operated air valve (0 280 141 ...)	A 19
2.6 Pressure-jump switch (0 280 111 ...)	A 21
2.7 Throttle-valve switch with potentiometer (0 280 120 4..)	B 1

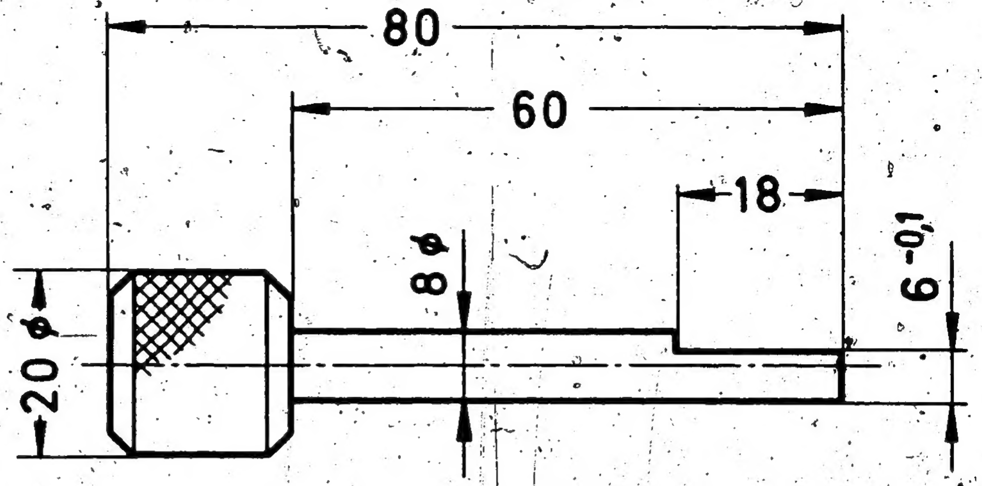
The following additional Jetronic components can only be tested by after-sales servi
in the right-hand column.

2.8	Vacuum limiter	(0 280 160 ...)	Test-spec list (gray
2.9	Control unit	(0 280 00. ...)	Test-spec list for L L-Jetronic
2.10	Air-flow sensor	(0 280 2.. ...)	Test-spec list for a
2.11	Auxiliary air device	(0 280 140 ...)	Test-spec list for
2.12	Solenoid-operated injection valve	(0 280 150 ...)	Test-spec list for
2.13	Electric fuel pump	(0 580 ... ...)	Test-spec list for
2.14	Fuel filter	(0 450 905 ...)	Test-spec list for
2.15	Pressure regulator	(0 280 160 2...)	Test-spec list for
2.16	Start valve	(0 280 170 ...)	Test-spec list for

omponents can only be tested by after-sales service workshops using the test equipment quoted

	(0 280 160 ...)	Test-specification sheet KH/VSK-KD 28/2001. See special list (gray file) for pressure-sensor tester KDJE 7401.
	(0 280 00. ...)	Test-specification sheets KH/VSK 28 P ... See special list for L-Jetronic test simulator 0 684 300 001 and L-Jetronic tester (digital) 0 684 100 201.
	(0 280 2.. ...)	Test-specification sheets KH/VSK 28 P 1 ... See special list for air-flow sensor tester KDJE 7404.
	(0 280 140 ...)	Test-specification sheets KH/VSK-KD 43/4 En. See special list for tester KDJE P 500.
valve	(0 280 150 ...)	Test-specification sheets KH/VSK-KD 43/4 En. See special list for tester KDJE-P 500.
	(0 580 ... ...)	Test-specification sheets KH/VSK-KD 43/4 En. See special list for tester KDJE-P 500.
	(0 450 905 ...)	Test-specification sheets KH/VSK-KD 43/4 En. See special list for tester KDJE-P 500.
	(0 280 160 2..)	Test-specification sheet KH/VSK-KD 43/4 En. See special list for tester KDJE-P 500.
	(0 280 170 ...)	Test-specification sheet KH/VSK-KD 43/4 En. See special list for tester KDJE-P 500.

A5



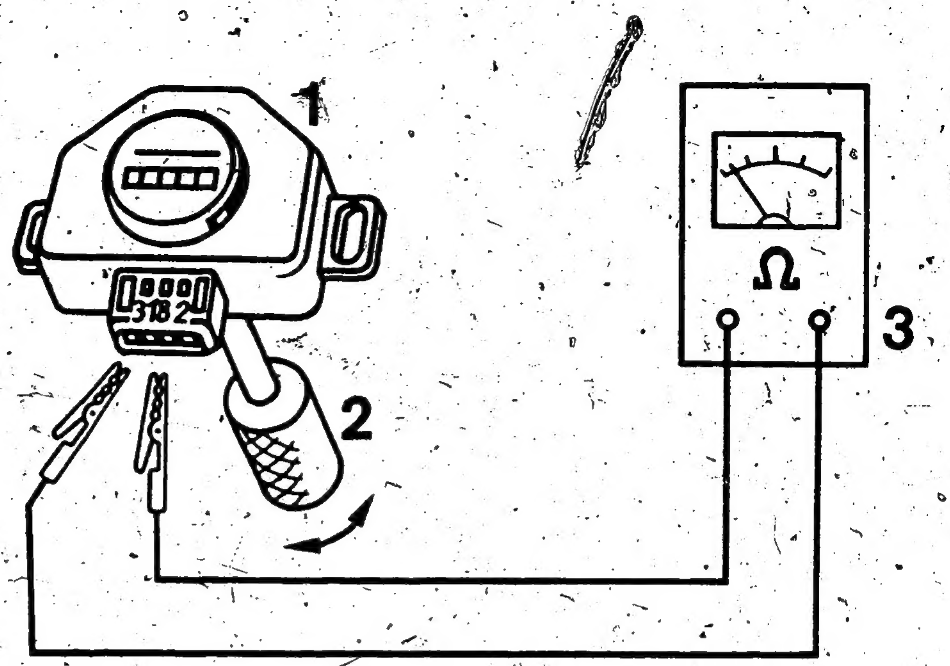
280/0340

Necessary measuring equipment

- Temperature cabinet (plus-minus temperature adjustable)
- Ohmmeter (digital display/analog display with max. 0.5% error)
- Voltmeter (min. 50 kΩ/V internal resistance)
- Voltage stabilizer (8 V...14 V/up to 5 A adjustable)
- Compressed-air supply, pressure reducer (adjustable to 1 bar)
- Compressed-air gun
- Chronometer (stopwatch)
- Hand vacuum pump (e.g. Mityvac)

Accessories

- Instrument leads
- Connection terminals/clips
- Test lead KDJE 7450/70
- Adjusting knob (user-fabricated - as replacement for throttle shaft). See drawing.
- Test leads KDUM 0008



280 034

1 = Throttle-valve switch
(object under test)
2 = Adjusting knob for shaft
3 = Ohmmeter

2.1 TEST THROTTLE-VALVE SWITCH (0 280 120 ...)

Visual examination

- Faults in materials
- Faults in workmanship
- Faults due to external influences (damage by a third party).

Functional test:

1. Mechanical test

- Fit the adjusting knob on the throttle-valve switch
- Move the adjusting knob as far as it will go in both directions
- Check for freedom of movement

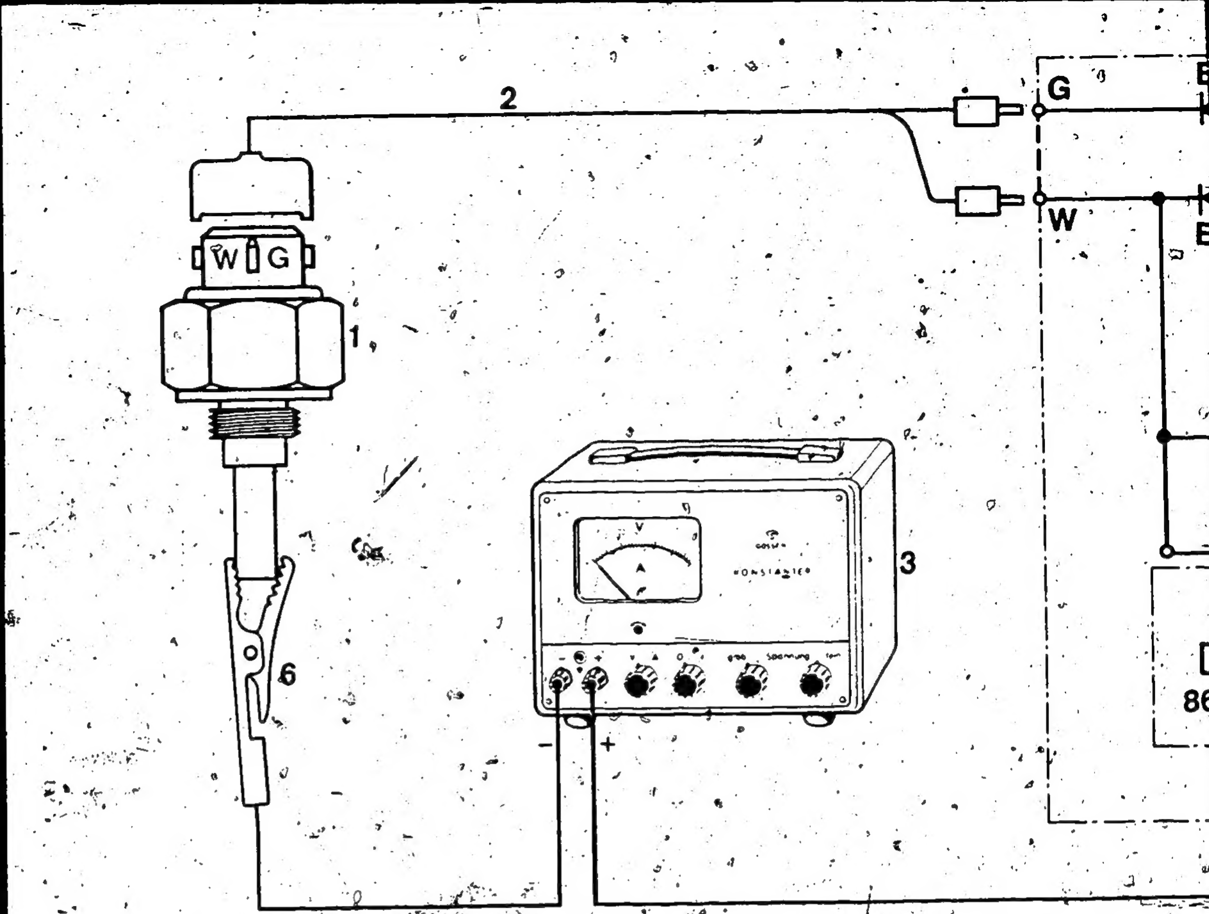
2. Electrical test

- Fit the adjusting knob on the throttle-valve switch
- Turn the adjusting knob as far as it will go in both directions repeatedly.
- Turn until the idle contact is closed (stop). Establish direction of rotation according to test chart.
- Connect ohmmeter to term. 2 and term. 18.
- For reading see test chart.
- Turn the adjusting knob further in the direction of rotation (idle contact opens). For reading see test chart.
- Turn adjusting knob further until full-load contact is closed (stop).
- Connect ohmmeter to term. 3 and term. 18. For reading see test chart.

Test chart for throttle-valve switch

Part No.	Direction of rotation	Connection ...-pin	Resistance Idle Term. 18-2 (Ω)	Part load Term. 18-2 (Ω)	Full load Term. 18-3 (Ω)
0 280 120 100	CW	5			
101	CW	5			
103	CW	5			
104	CW	5			
105	CW	5			
106	CW	5			
107	CW	5			
200	CW	3			
201	CW	3			
202	CW	3			
203	CCW	3			
206	CCW	3			
207	CW	3			
208	CW	3	$0^{+0.2}$	Infinity	$0^{+0.2}$
210	CW	3			
211	CW	3			
212	CCW	3			
214	CW	3			
215	CCW	3			
216	CW	3			
300	CCW	3			
301	CW	3			
302	CCW	3			
303					
304	CCW	3			
305	CCW	3			
307	CCW	3			
308	CW	3			
309	CW	3			
310	CW	3			
311	CW	3			
312	CW	3			
313	CW	3			
314	CCW	3			

CW = Clockwise CCW = Counterclockwise



2.2 TEST THERMO-TIME SWITCH
(0 280 130 2..)

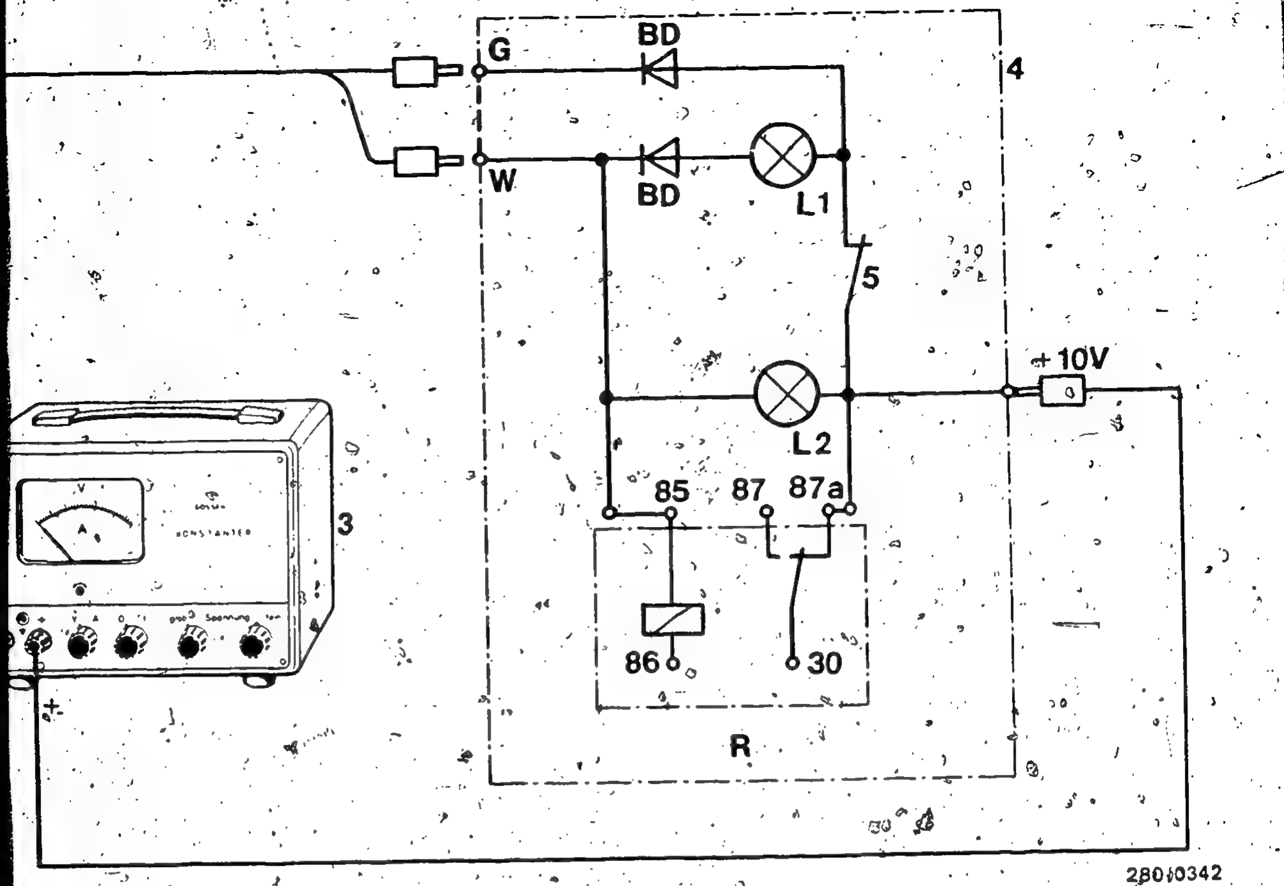
1 = Thermo-time switch (object under test)

2 = Test lead KDJE 7450/70
3 = Voltage stabilizer
4 = Circuit design
5 = Starting button
6 = Ground (-)

BD
L
R

Testing the thermo-time switch	
Jetronic component testing	

Testi
Jetro



2 = Test lead KDJE 7450/70
3 = Voltage stabilizer
4 = Circuit design
5 = Starting button
6 = Ground (-)

BD = Bosch diode e.g. 0 270 000 001, ... 002
L_1/L_2 = Lamps 12 V/2 W
R = Relay e.g. 0 332 204 125,

Testing the thermo-time switch

Jetronic component testing

Visual examination:

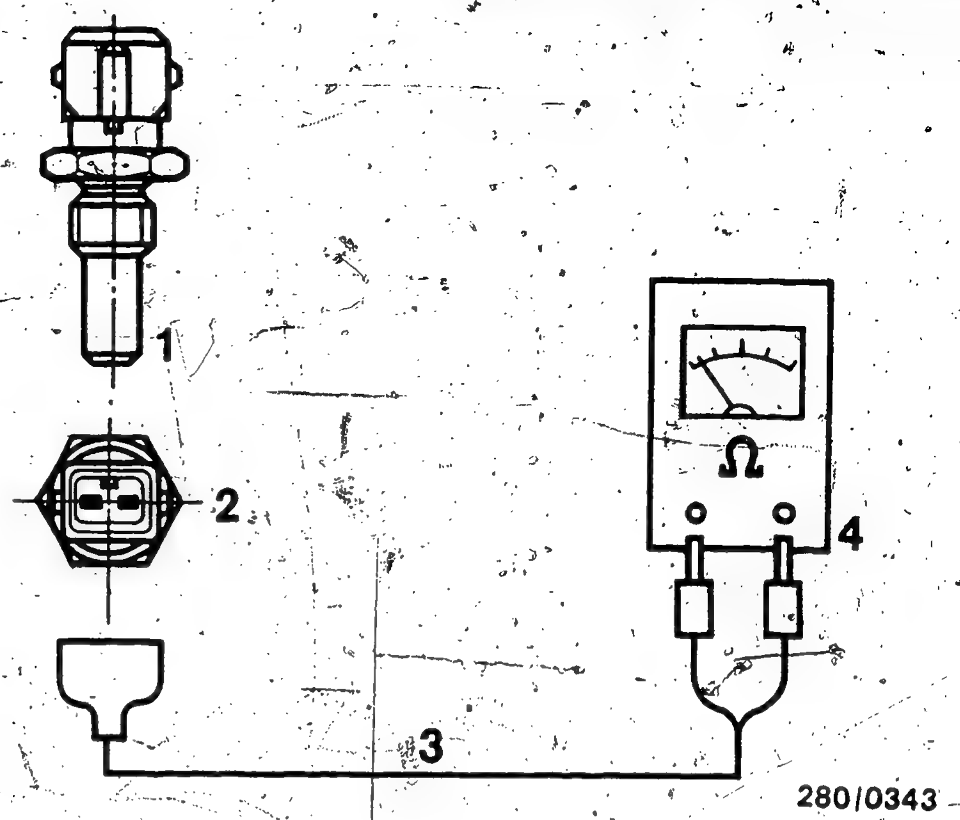
- Faults in materials
- Faults in workmanship
- Faults due to external influences (damage by third party)

Electrical test

- Cool the thermo-time switch to -20°C in the temperature cabinet.
- Leave at temperature for approx. 1 hour.
- Connect the thermo-time switch to the test circuit described (e.g. using test lead KDJE 7450/70).
- Apply a voltage of 10 V to the circuit. Simultaneously actuate the starting button and the chronometer (stopwatch).
- Both lamps must light up; the relay must chatter.
- For switching time see test chart.
- After the switching time has elapsed, lamp L_2 must go out and the relay must drop out.

Test chart for thermo-time switch

Part No.:	Switching-point temperature (°C)	Switching time (sec.) (-20°C/ 10 V)	Switching-time tolerance (sec.)
0 280 130 200	35	8	4...12
201	35	12	7...17
202	15	8	4...12
203	15	8	4...12
204	35	8	4...12
205	0	6	2...10
206	0	6	2...10
207	35	12	7...17
208	13	8	4...12
209	13	8	4...12
212	35	8	4...12
213	15	8	4...12
214	35	8	4...12
215	18	8	4...12
216	18	8	4...12
217	45	9.5	5...14
218	35	8	4...12
219	15	8	4...12
220	35	12	7...12
221	18	8	4...12
222	18	8	4...12
223	35	8	4...12
224	35	12	7...17
225	80	8	4...12
228	15	8	4...12
229	35	8	4...12



1 = Temperature sensor (object under test)
2 = Terminal diagram
3 = Test lead (KDJE 7450/70)
4 = Ohmmeter

2.3 TESTING TEMPERATURE SENSOR (0 280 130..)

Tests:

- Electrical test
- Resistance measurement at given temperatures

Visual examination:

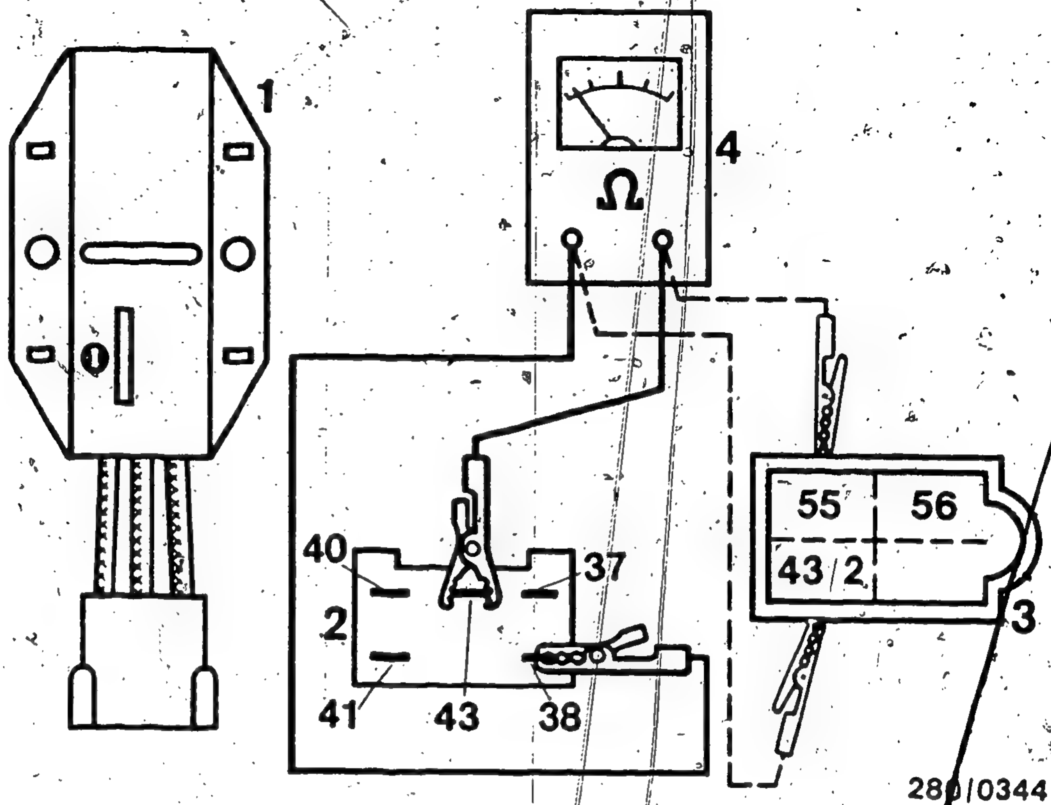
- Faults in materials
- Faults in workmanship
- Faults due to external influences (damage by a third party)

Electrical test:

- Heat/cool the temperature sensor in the temperature cabinet.
  For test temperatures see test chart.
- Measure resistance after approx. 1 hour at each of the given temperature thresholds.
- For tolerance range for resistance see test chart.

Test chart for temperature sensor

Part No.:	Resistance at 20°C (kΩ)	Resistance tolerance -10°C (kΩ)	20°C (kΩ)	80°C (Ω)
0 280 130 012	2.5	7-12	2 - 3	250-400
013	2.5	7-12	2 - 3	250-400
017	1.6	7-12	1.2-2.0	
018	1.6	7-12	1.2-2.0	
023	2.5	7-12	2 - 3	250-400
026	2.5	8-11	2.2-2.8	270-380
027	2.5	7-12	2 - 3	250-400
028	10	31-54	8 - 12	700-1400
032	2x2.5	8-11	2.2-2.8	270-380
033	2.5	8-11	2.2-2.8	270-380
034	2.5	8-11	2.2-2.8	270-380
035/ 036	2.5	8-11	2.2-2.8	270-380
037/ 038	2.5	8-11	2.2-2.8	270-380
039	2.5	8-11	2.2-2.8	270-380
040/ 041	2.5	8-11	2.2-2.8	270-380
042/ 043	2x2.5	8-11	2.2-2.8	270-380
044/ 045	2x2.5	8.5-10.5	2.3-2.7	300-350
046	10	---	8.5-11.5	950-1110



1 = Series resistor (4-terminal)
    (object under test)
2 = Connector (6-pin)
3 = Connector (4-pin)
4 = Ohmmeter

2.4 TESTING SERIES RESISTOR (0 280 120..)

Tests:

- Electrical test
- Resistance measurement

Type of connection:

1. In the case of 4-terminal resistors:

- Term. 43 common connection
- Test terminals 37, 38, 40 and 41 one after the other.

2. In the case of 2-terminal resistors:

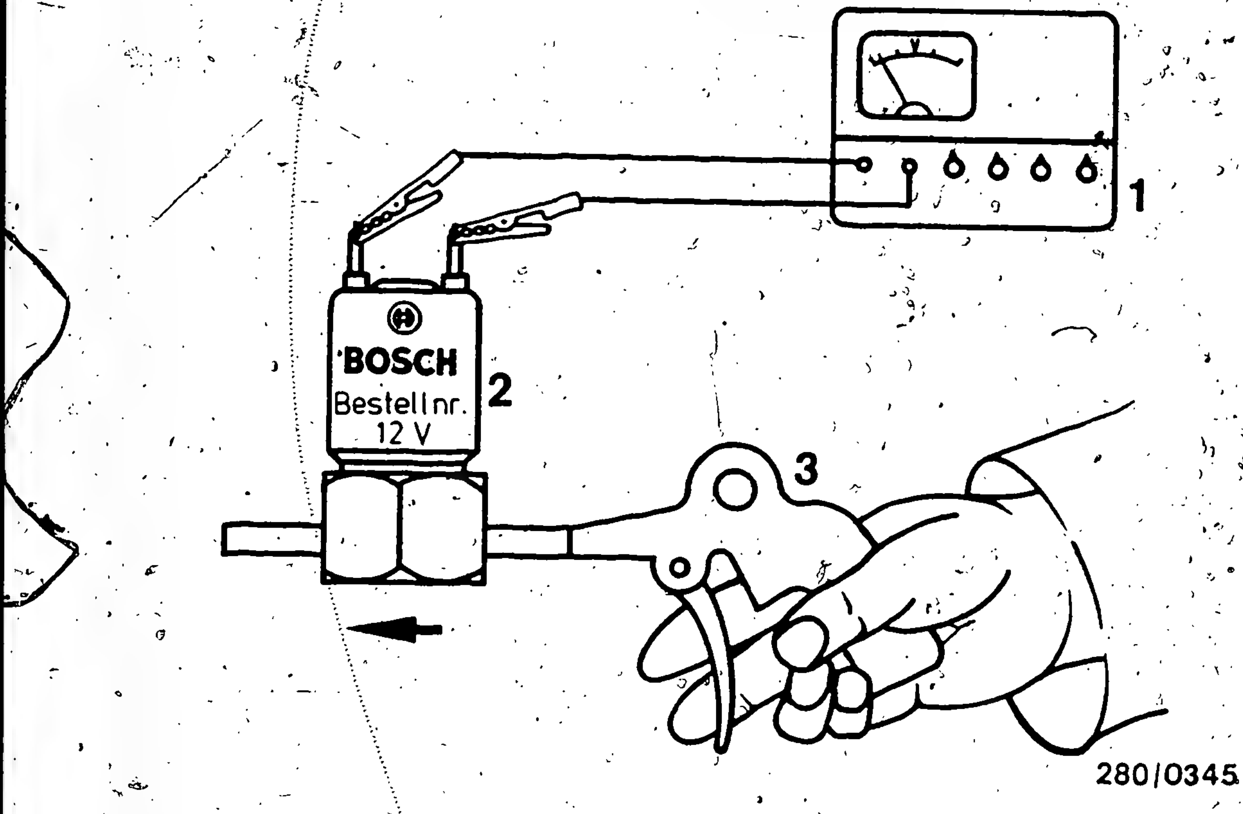
- Term. 43/2 common connection
- Test terminals 55 and 56 one after the other.

Visual examination:

- Faults in materials
- Faults in workmanship
- Faults due to external influences (damage by a third party)

Electrical test:

- Test temperature at 20°C...30°C.
- Connect one terminal of the ohmmeter to term. 43 (in the case of 4-terminal series resistor) and 43/2 (in the case of 2-terminal series resistor).
- Connect the other terminal of the ohmmeter to all the other terminals one after the other (see test setup).
- Test specification of one series resistor 5...7 Ω (all versions)



1 = Voltage stabilizer
2 = Solenoid-operated air valve (object under test)
3 = Compressed-air gun
Arrow = Direction of flow

2.5 TESTING SOLENOID-OPERATED AIR VALVE (0 280 141...)

Tests:

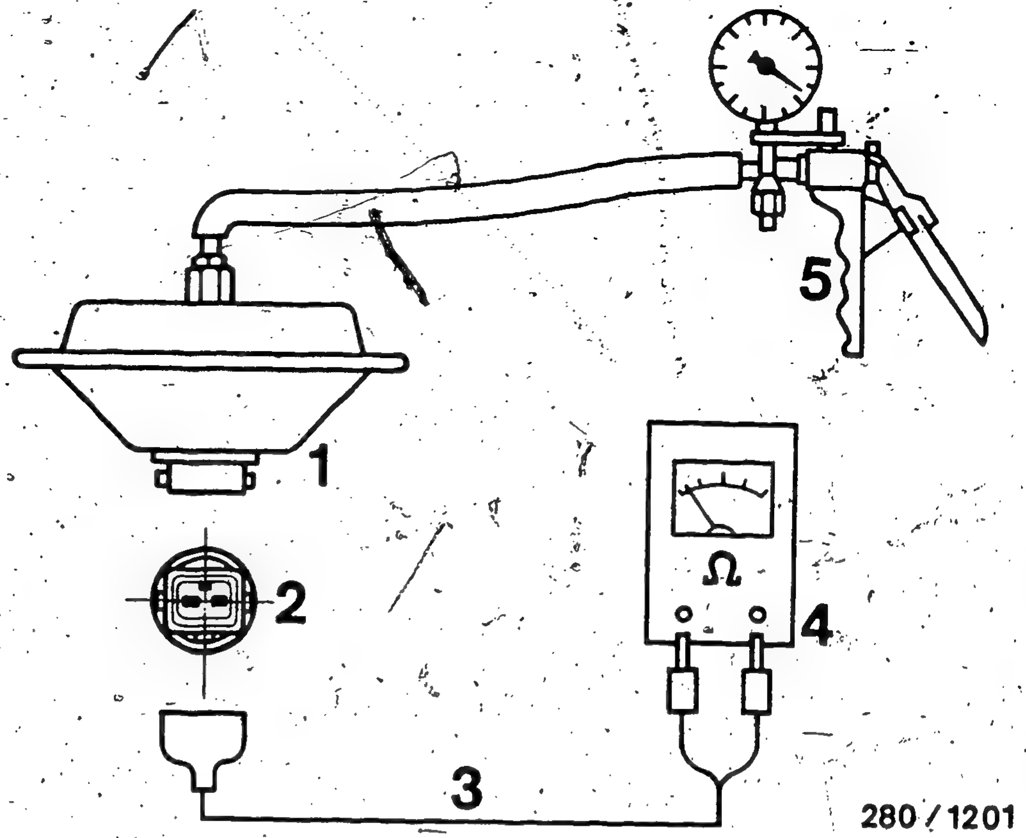
- Electrical test
- Pneumatic flow test

Visual examination:

- Faults in materials
- Faults in workmanship
- Faults due to external influences (damage by a third party).

Electrical test:

- Connect compressed air (1 bar) to the inlet of the solenoid-operated air valve.
- Only a small amount of air must escape on the return side.
- Apply voltage (10 V) to the solenoid-operated air valve.
- Armature of the solenoid-operated air valve must pull in.
- Re-connect compressed air (1 bar) to the inlet of the solenoid-operated air valve.
- A clearly increased amount of air must escape on the return side.



1 = Pressure-jump switch
2 = Terminal diagram
3 = Test lead (KDJE 7450/70)
4 = Ohmmeter
5 = Mityvac pump

2.6 TESTING PRESSURE-JUMP SWITCH (0 280 111 ....)

Tests:

- Resistance measurement at variable atmospheric pressure.

Visual examination:

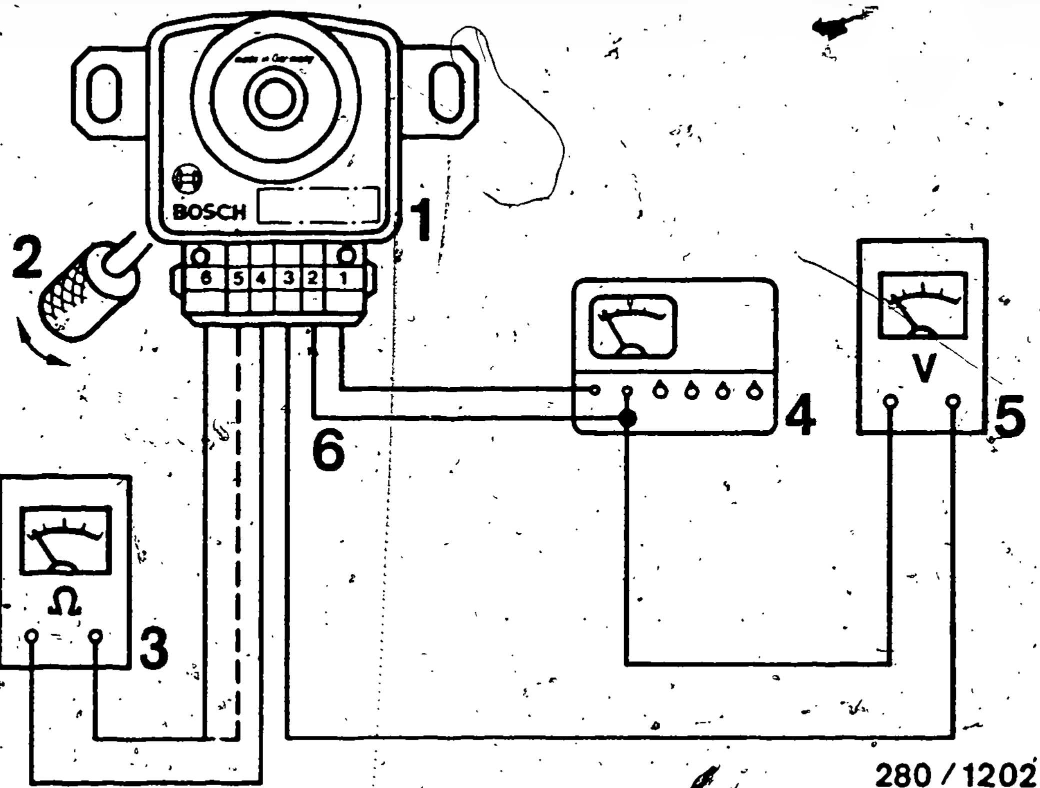
- Faults in materials
- Faults in workmanship
- Faults due to external influences (damage by a third party)

Electrical test:

- Connect ohmmeter to the electrical connection on the pressure-jump switch.
- Connect Mityvac pump to intake-manifold connection.
- See test chart for negative gauge pressure test specification.

Test chart for pressure-jump switch

Part No.:	Testing point at a negative gauge pressure of (mbar)
0 280 111 001	550 ... 650
002	550 ... 650
003	350 ... 450
004	550 ... 650
005	550 ... 650
006/007	550 ... 650
008	350 ... 450
009/010	550 ... 650



1 = Throttle-valve switch with potentiometer (object under test)
2 = Adjusting knob for shaft
3 = Ohmmeter
4 = Voltage stabilizer
5 = Voltmeter
6 = Test leads KDUM 0008

2.7 TESTING THROTTLE-VALVE SWITCH WITH POTENTIOMETER (0 280 120 4..)

Visual examination:

- Faults in materials
- Faults in workmanship
- Faults due to external influences (damage by a third party)

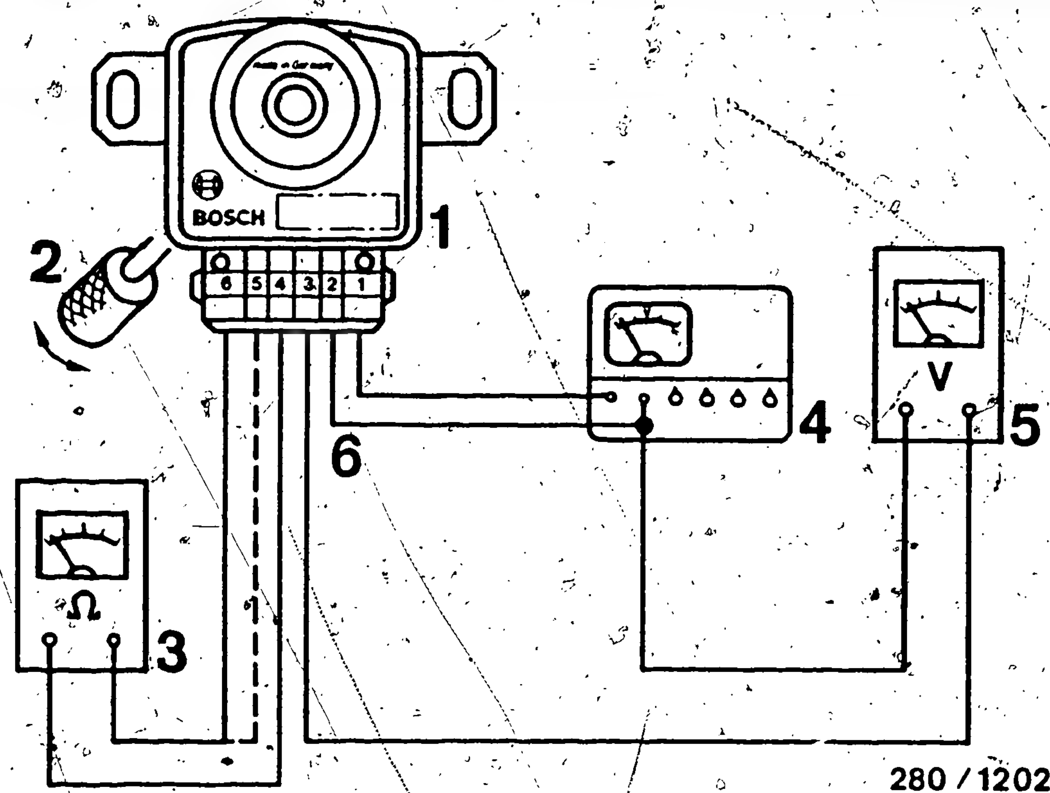
Functional test:

1. Mechanical test

- Fit the adjusting knob on the throttle-valve switch
- Move the adjusting knob as far as it will go in both directions
- Check for freedom of movement

2. Electrical test (switch)

- Fit the adjusting knob on the throttle-valve switch
- Turn the adjusting knob as far as it will go in both directions repeatedly.
- Turn until the idle contact is closed (stop). Establish direction of rotation according to test chart.
- Connect ohmmeter to term. 4 and term. 6. For reading see test chart.
- Turn the adjusting knob further in the direction of rotation (idle contact opens). For reading see test chart.
- Turn adjusting knob further until full-load contact is closed (stop).
- Connect ohmmeter to term. 4 and term. 5. For reading see test chart.



3. Electrical test (potentiometer)

- ~~Fit~~ the adjusting knob on the throttle-valve switch
- Turn the adjusting knob as far as it will go in both directions repeatedly
- Turn until the idle contact is closed (turn to stop, microcontact must close, check by listening). Establish direction of rotation according to test chart.
- Set voltage stabilizer to 5.00 V.
- Connect voltage stabilizer to throttle-valve switch with KDUM 0008.
  Term. 1 (positive)
  Term. 2 (negative)
- Connect voltmeter to throttle-valve switch.
  Term. 3 (positive connection)
  Term. 2 (negative connection)

Testing throttle-valve-switch with pot.	
Jetronic component testing	

- Set idle with adjusting knob (contact must have switched, check by listening)
  See test chart for reading.

- Turn the adjusting knob further in the direction of rotation (idle contact opens, check by listening). Reading must rise.

- Starting from the idle position, turn the adjusting knob further by 90°. See test chart for reading. (If knob is turned by further than approx. 90°, reading may be 0 V. Turn back adjusting knob 1...2°. Reading must be correct).

Test chart for throttle-valve switch with potentiometer

Part No.	Direction of rotation	Connection pin	Resistance Idle Term. 4-Term. 6 (Ω)	Part load Term. 4-Term. 6 (Ω)	Full l… Term. …
0 280 120 400	Clockwise	6	0 +0.2		
401	Counterclockwise	6	0 +0.2		
402	Clockwise	6	0 +0.2		
404	Clockwise	6	0 +0.2		

with potentiometer

…nection …-pin	Resistance Idle Term. 4-Term. 6 (Ω)	Part load Term. 4-Term. 6 (Ω)	Full load Term. 4-Term. 5 (Ω)	Voltage Idle Term. 3-Term. 2 (V)	Full load Term. 3-Term. 2 (V)
6	$0^{+0.2}$	∞	∞	0.44...0.77	4.3...5.0
6	$0^{+0.2}$	[illegible]	∞	0.44...0.77	4.3...5.0
6	$0^{+0.2}$	∞	$0^{+0.2}$	0.44...0.77	4.3...5.0
6	$0^{+0.2}$	∞	$0^{+0.2}$	0.44...0.77	4.3...5.0

After-sales Service
Test Specifications

Only for use within the Bosch organization. Not to be communicated to any third party.

L-JETRONIC 28

Throttle-valve switch VDT-W-280/1011 En
Ed. 1

Part no.	Direction of rotation	Connection ...pole	Resistance value Idle Ter. 18 -2 (Ω)	Part-load Ter. 18-2 (Ω)	Full-load Ter. 18-3 (Ω)
0 280 120 100	right	5	$0^{+0.2}$	∞	$0^{+0.2}$
101	right	5	$0^{+0.2}$	∞	$0^{+0.2}$
103	right	5	$0^{+0.2}$	∞	$0^{+0.2}$
104	right	5	$0^{+0.2}$	∞	$0^{+0.2}$
105	right	5	$0^{+0.2}$	∞	$0^{+0.2}$
106	right	5	$0^{+0.2}$	∞	$0^{+0.2}$
107	right	5	$0^{+0.2}$	∞	$0^{+0.2}$
200	right	3	$0^{+0.2}$	∞	$0^{+0.2}$
201	right	3	$0^{+0.2}$	∞	$0^{+0.2}$
202	right	3	$0^{+0.2}$	∞	$0^{+0.2}$
203	left	3	$0^{+0.2}$	∞	$0^{+0.2}$
206	left	3	$0^{+0.2}$	∞	$0^{+0.2}$
207	right	3	$0^{+0.2}$	∞	$0^{+0.2}$
208	right	3	$0^{+0.2}$	∞	$0^{+0.2}$
210	right	3	$0^{+0.2}$	∞	$0^{+0.2}$
211	right	3	$0^{+0.2}$	∞	$0^{+0.2}$
212	left	3	$0^{+0.2}$	∞	$0^{+0.2}$
214	right	3	$0^{+0.2}$	∞	$0^{+0.2}$
215	left	3	$0^{+0.2}$	∞	$0^{+0.2}$
216	right	3	$0^{+0.2}$	∞	$0^{+0.2}$
300	left	3	$0^{+0.2}$	∞	$0^{+0.2}$
301	right	3	$0^{+0.2}$	∞	$0^{+0.2}$
302	left	3	$0^{+0.2}$	∞	$0^{+0.2}$

After-sales Service
Test Specifications

Only for use within the Bosch organization. Not to be communicated to any third party.

L-JETRONIC

Temperature Sensor

28
VDT-W-280/1013 En
Ed. 1

Part no:	Resistance value at 20° C (kΩ)	Resistance tolerance at		
		-10° C (kΩ)	20° C (kΩ)	80° C (kΩ)
0 280 130 012	2.5	7...12	2...3	250...400
013	2.5	7...12	2...3	250...400
023	2.5	7...12	2...3	250...400
026	2.5	8...11	2.2...2.8	270...380
027	2.5	7...12	2...3	250...400
028	10	31...54	8...12	700...1400

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

B3

After-sales Service
Test Specifications

Part no.	Switching point temperature (°C)	Switching time (sec) (-20° C/10 V)	Switching time tolerance (sec)
0 280 130 200	35	8	4...12
201	35	12	7...17
202	15	8	4...12
203	15	8	4...12
204	35	8	4...12
205	0	6	2...10
206	0	6	2...10
207	35	12	7...17
208	13	8	4...12
209	13	8	4...12
212	35	8	4...12
213	15	8	4...12
214	35	8	4...12
215	18	8	4...12
216	18	8	4...12
217	45	9.5	5...14
218	35	8	4...12
219	15	8	4...12
220	35	12	7...17
221	18	8	4...12
222	18	8	4...12
223	35	8	4...12
224	35	12	7...17
225	80	8	4...12

FUEL PUMPS 0 580 254 9..

with replaceable non-return valve

On various new-model fuel pumps 0 580 254 9.., it is possible to replace the non-return valve. These pumps are recognisable by their light-metal housing and centrally arranged suction and pressure fittings. See also VDT-W-438/500.

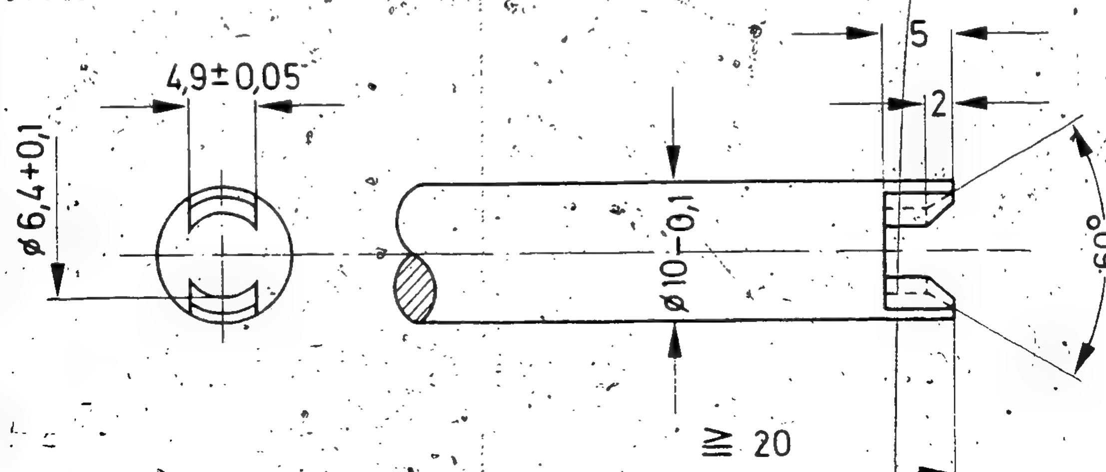
The non-return valve in question, together with the necessary O-ring, is available as a set under the part number 1 587 410 901.

Assembly

Clean the hose connection thoroughly at the pressure fitting and unscrew it.
Unscrew the non-return valve using a pin screwdriver (see Fig.).
Screw in the new non-return valve.
Do not over-tighten. Tightening torque of 0.4...0.6 Nm (4...6 kgf/cm) is to be adhered to.
The thread is plastic. The non-return valve is sealed with an O-ring.

Tool

Manufacture the pin-type screwdriver yourself according to the sketch. It can also be made from a conventional screwdriver with a 9...10 mm blade.



BOSCH
Geschäftsbereich KH Kundendienst, Kfz-Ausrüstung
© by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

Overview of the non-return valves

Replaceable non-return valves

Part Number	Appropriate seal ring	Fitted in supply pumps
1 583 385 004	1 580 203 002	0 580 254 990, ..991, ..998
.. 006	.. 002	.. 985
1 583 386 008	.. 001	.. 987, ..998, ..989,
		0 580 364 002,
		0 580 464 005, ..006, ..007,
		..009, ..010, ..011
1 583 386 011	1 580 203 001	0 580 254 986, ..996
.. 014	.. 001	.. 992
.. 016	.. 105 001	.. 970, ..971, ..972
		.. 973, ..974, ..980
		0 580 464 017

Parts sets (comprising non-return valve complete with seal ring)

1 587 010 001	-	0 580 254 992
1 587 410 901	-	.. 978, ..982 FD823 →

Supply pumps fitted with non-replaceable non-return valves

0 580 254 975, ..976, ..977, ..979, ..982 → FD 822
0 580 463 005, ..006, ..007, ..008, ..009, ..010, ..011
0 580 464 008, ..013, ..014, ..015, ..017
0 580 960 001, ..003, ..004, ..007, ..008, ..009, ..011, ..012, ..013
0 580 970 001, ..004

BOSCH Geschaftsbereich KH Kundendienst Kfz-Ausrüstung
© by Robert Bosch GmbH, D-7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

B6

36

FIRMLY FITTED NON-RETURN VALVE

Repairs
fuel pumps 0 580 254

Previously fuel pumps with non-exchangeable non-return valve (see VDT-I-438/104 En) had to be exchanged completely in cases of leakages in the non-return valve.

If the fuel pump is in working order and only the non-return valve leaks, there is now the possibility of repairs as part of after-sales service. 2 parts sets have been produced for this purpose, they contain, amongst other things, a tube fitting with built-in non-return valve.

Before using the parts set the installation conditions should be checked. The defective non-return valve can remain in the fuel pump which does not have to be dismantled for fitting the parts set. Before disconnecting the fuel lines the pressure fittings of the fuel pump and the fuel lines should be thoroughly cleaned.

Description and fitting

Parts set 1 587 010 003 for fuel connection with inlet union.

Screw the tube fitting (short side) with the thick flat seal ring into the pressure fitting and tighten. In doing so press against the hexagon of the pressure fitting with a wrench. Place the thin flat seal ring, the fuel-line inlet union and the other flat seal ring on to the long side of the tube fitting and tighten with the hexagon cap nut. Run the engine and check that there are no leaks in the connection.

Parts set 1 587 010 004 for fuel connection with nipple and union nut.

Screw the tube fitting with flat seal ring into the pressure fitting and tighten. In doing so press against the hexagon of the pressure fitting with a wrench. Screw the fuel line to the tube fitting with a union nut and tighten. Run the engine and check that there are no leaks in the connection.

BOSCH Geschäftsbereich KH Kundendienst, Kfz-Ausrüstung
© by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

After-sales Service Instructions

Testing

22

VDT-W-227/308 B

Breakerless Capacitor-Discharge Ignition System (CDI-i)

with trigger box 0 227 300 003

BOSCH After-sales Service Automotive Equipment

B8

Table of Contents

Caution!

High-energy ignition system. Dangerous primary and secondary voltages.

Please take note of our technical bulletin VDT-I-227/102 B

Automotive Equipment — After-sales Service
Department for Technical Publications KH/VDT
Postfach 50, D-7000 Stuttgart 1

Please direct questions and comments concerning the contents to our authorized representative in your country.

Printed in the Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.
(2. 77)

W 227/ 308
Seite 3

1. Test Equipment and Auxiliary Materials

Voltage stabilizer ≧ 20 V/15 A	commercially available
Precision oscilloscope, e. g. Hameg 312 (with 1:1 and 1:10 voltage dividers)	commercially available
or	
Philips PM 3200 (with 1:1 and 1:10 voltage dividers)	commercially available
Distributor test bench EFZV 10	0 680 123 001
Complete ignition system consisting of:	
Trigger box (test specimen)	0 227 300 003
Connecting parts set (for the trigger box) consisting of: 1 protective cap, 1 plug connector, 7 contact springs	1 227 000 024
Ignition distributor (6 Cyl. 600 Ω pulse generator)	0 237 300 001
Ignition transformer	0 221 121 010
2 ignition-cable terminals for the ignition transformer	1 901 353 126
Suppression connectors 1 kΩ for ignition transformer (prevent false triggering) e. g.	0 356 250 014 or . . . 019
1 potentiometer 20 kΩ, 1/3 W (linear)	commercially available
1 resistor 620 Ω, 1/3 W ± 5%	commercially available
approx. 1.5 m cable 1.5 mm² e. g.	6 210 150 150

2. Workshop Instructions

- Specified parts of the complete ignition system, including the connecting parts set, should always be used to avoid **destruction and incorrect measurement.**
- The measurements must be made at room temperature.
- It is important that the measurements be made at the respective voltage specified.
- The ignition distributor specified for the test must be checked at regular intervals in accordance with the prescribed ignition distributor test instructions.
- Due to the fact that up to 450 V can be present at term. "A" of the ignition transformer, equipment such as timing lights, test lamps and suppression capacitors must not be connected to it. Even after the trigger box has been switched off (ignition off), terminal "A" must not contact ground otherwise electronic components will be destroyed.

3. Preparations for Testing

3.1 Voltage Divider for User Fabrication

The following parts are needed:

1 potentiometer	20 kΩ, 1/3 W (linear)
1 resistor	620 Ω, 1/3 W ± 5%

Connect parts electrically, see Fig. 1.

Note:
To simplify testing, the voltage divider can be permanently mounted on a board and equipped with connector sockets.

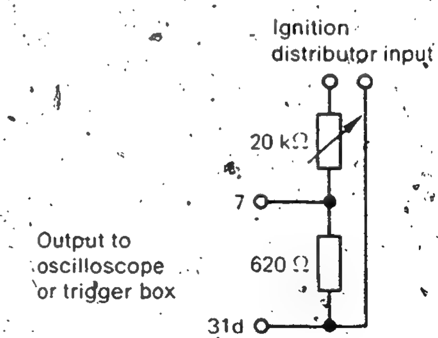


Figure 1 Voltage divider

1 = Trigger box
2 = Ignition distributor
3 = Voltage divider
4 = Ignition transformer with 1 kΩ suppression connector
5 = Distributor test bench
6 = Different ignition-distributor connectors (note position of the long orientation lugs-arrows)
7 = Voltage stabilizer
8 = Oscilloscope

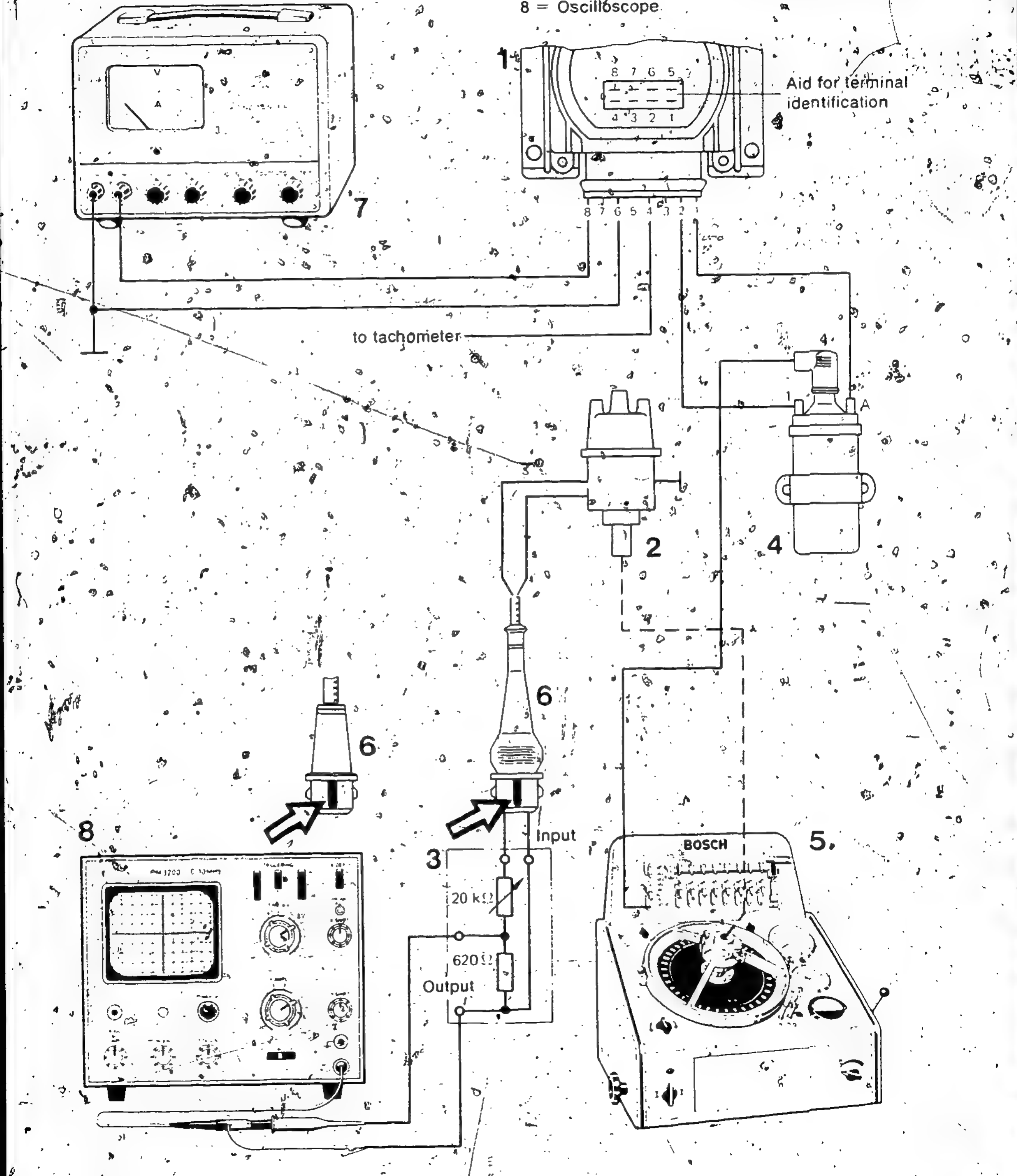


Figure 2 Connection Diagram

3.2 Set Up Complete Ignition System

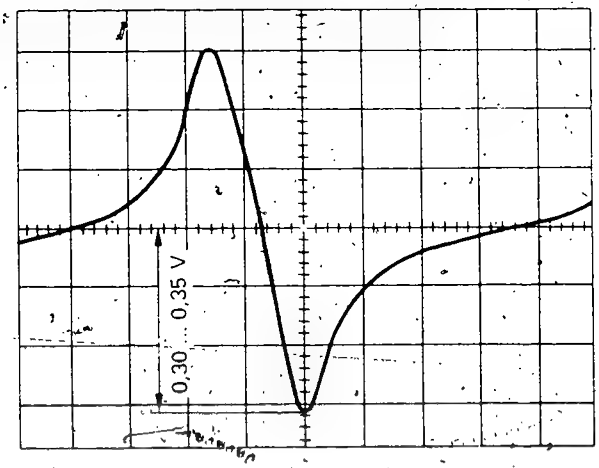
Switch on the voltage stabilizer and set to 14 V.
Switch off stabilizer.
Set up ignition system, testers, including the voltage divider, (see section 2 for parts) and connect electrically in accordance with the connection diagram, Fig. 2.

Note:
Pay attention to ground connection between voltage stabilizer and ignition distributor. Connect the high-voltage terminal 4 from the ignition transformer to the **set-and-locked spark gap** of the distributor test bench.

3.3 Set the Threshold Voltage

Using the appropriate flange, clamp the ignition distributor into the EFZV 10 distributor test bench and drive at a speed of 250 min^{-1}.
Connect the ignition distributor to the voltage divider input (Fig. 2).
Connect the oscilloscope with the voltage divider on 1:1 to the (user-fabricated) voltage divider output, and turn the potentiometer of the voltage divider until the oscilloscope reads 0.30 . . . 0.35 V, the negative half-wave being measured; see Fig. 3.

Note:
The speed of the distributor test bench must be continually checked and corrected as needed during the following measurement.



Settings:
y = 0.1 V/major division
x = 5 ms/major division
0,30 . . . 0.35 V

Figure 3 Threshold Voltage

4. Testing

4.1 Test the Input Stage

Disconnect the oscilloscope from the voltage divider output. Connect the output to the trigger box (do not mix up terminals), Fig. 4.
Switch on the voltage stabilizer and set to 14 V.
The ignition spark must now be visible at the spark gap. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer.

1 = Trigger box
2 = Ignition distributor
3 = Voltage divider
4 = Ignition transformer with 1 kΩ suppression connector
5 = Distributor test bench
6 = Different ignition-distributor connectors (note position of the long orientation lugs — arrows)
7 = Voltage stabilizer

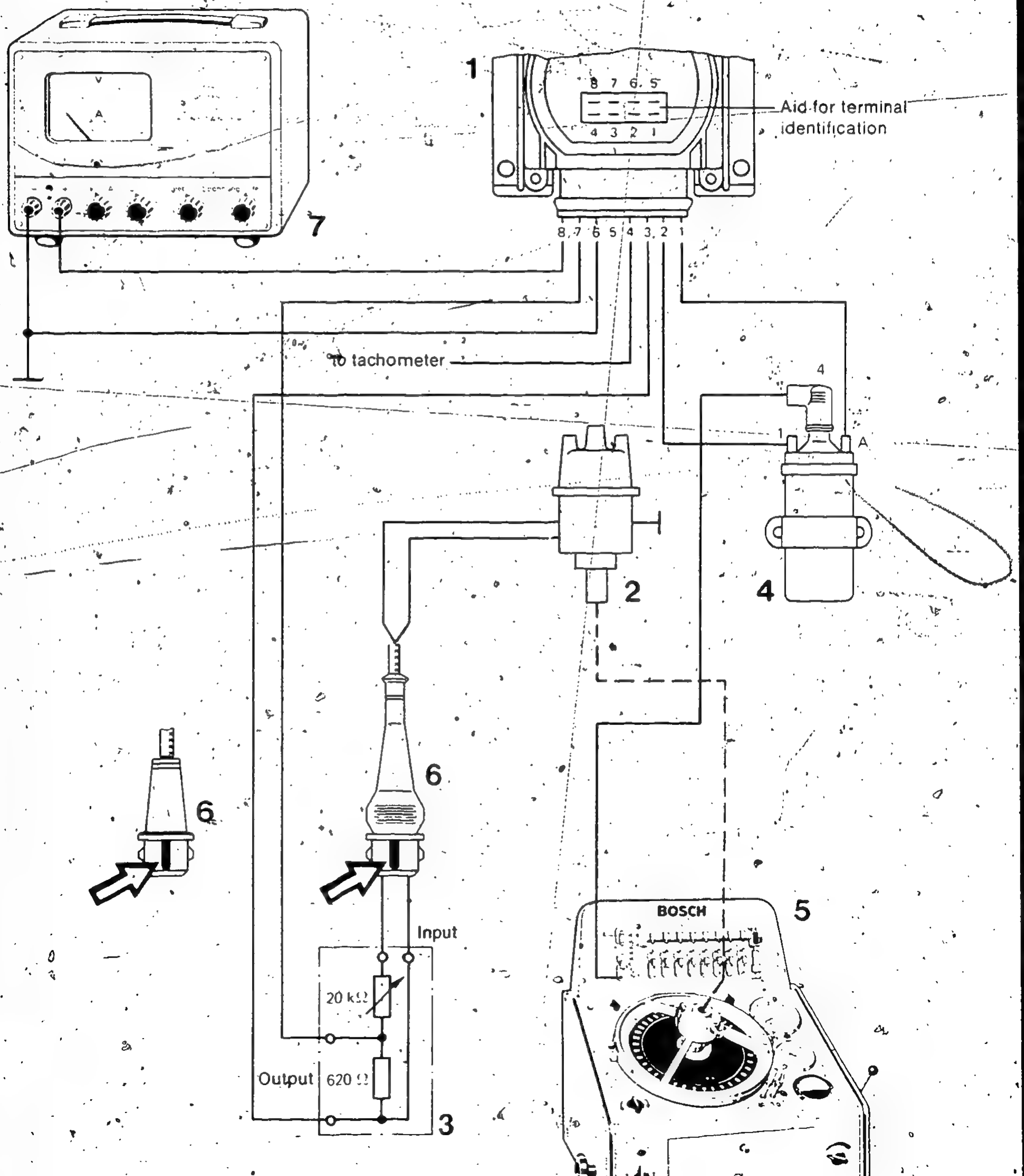


Figure 4 Connection Diagram

4.2 Test the Output Stage

Disconnect the voltage divider and connect the ignition distributor directly to the trigger box, Fig. 5.
Connect the oscilloscope (voltage divider 1:10) between trigger box term. 4 and ground according to Fig. 5.

1 = Trigger box
2 = Ignition distributor
4 = Ignition transformer with 1 kΩ suppression connector
5 = Distributor test bench
6 = Different ignition-distributor connectors (note position of the long orientation lugs – arrows)
7 = Voltage stabilizer
8 = Oscilloscope

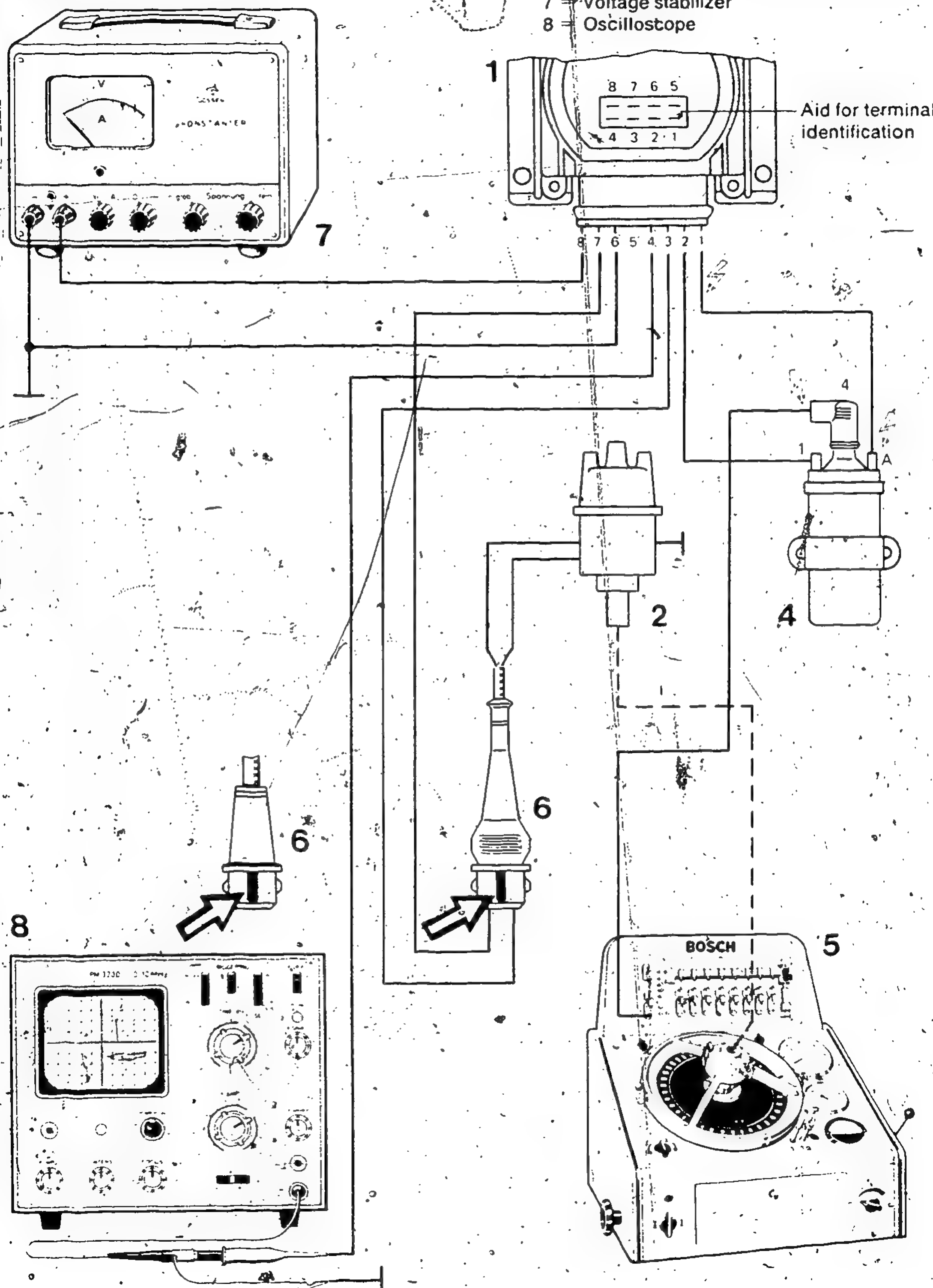
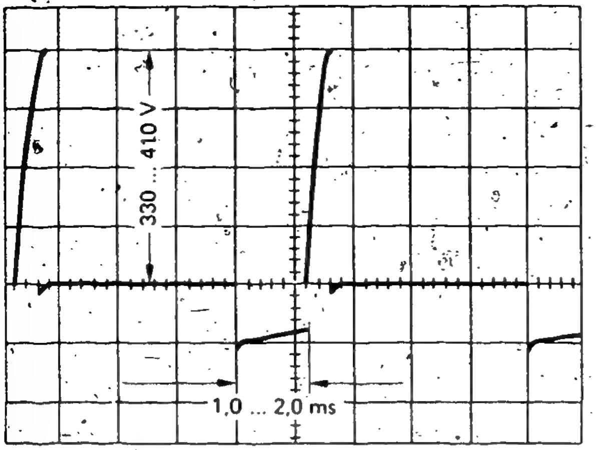


Fig. 5 Connection diagram



Settings:
y = 10 V/major division
x = 1.0 ms/major division
330 ... 410 V

Figure 6 Charging voltage

Drive the ignition distributor at 2000 min^{-1}.
Switch on the voltage stabilizer and set it to 14 V.
Sparks must appear across the spark gap.
The oscillogram displayed must correspond to that shown in Fig. 6. If this is not the case, the trigger box is defective. Switch off the voltage stabilizer.

4.3 Check Tachometer Function

If the results from 4.2 are positive, then the output circuity for the electronic tachometer is in order.

4.4 Operating Test at 6 Volts

Switch on the voltage stabilizer and set to 6 V.
Switch off the stabilizer.
Drive the ignition distributor at a speed of approx. 100 min^{-1}.
Switch on the voltage stabilizer.
If the trigger box is not defective, sparks must be visible at the spark gap. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer.

After-sales Service Instructions

Testing

22

VDT-W-227/311 B
Ed. 1

Breakerless Capacitor-Discharge Ignition System (CDI-i)

with trigger box 0 227 300 004

BOSCH After-sales Service
Automotive
Equipment

B16

Table of Contents

Caution!

High-energy ignition system. Dangerous primary and secondary voltages.

Please take note of our technical bulletin VDT-I-227/102 B.

Automotive Equipment – After-sales Service
Department for Technical Publications KH/VDT
Postfach 50, D-7000 Stuttgart 1

Please direct questions and comments concerning the contents to our authorized representative in your country.

Printed in the Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.
(12.77)

B17

W - 227(31(

1. Testers and Auxiliary Materials

Voltage stabilizer ≥ 20 V/15 A	commercially available
Precision oscilloscope, e. g. Hameg 312 (with 1:1 and 1:10 voltage dividers)	commercially available
or	
Philips PM 3200 (with 1:1 and 1:10 voltage dividers)	commercially available
Ignition distributor test bench EFZV 10	0 680 123 001
Complete ignition system consisting of:	
Trigger box (test specimen)	0 227 300 004
Connecting parts set (for the trigger box) consisting of: 1 protective cap, 1 plug connector, 7 contact springs	2 227 000 106
Ignition distributor (6 cyl. 600 Ω pulse generator) e. g.	0 237 300 001
Ignition transformer	0 221 121 001
2 terminals for ignition transformer	1 901 353 126
Suppressor 1 kΩ for ignition transformer, (prevents incorrect triggering), e. g.	0 356 250 014 or . . 019
1 potentiometer 20 kΩ, 1/3 W (linear)	commercially available
1 resistor 620 Ω, 1/3 W ± 5%	commercially available
1 resistor 10 kΩ, 1/8 W ± 5%	commercially available
approx. 3.0 m cable, 1.5 mm², e. g.	6 210 150 150

2. Workshop Instructions

- Specified parts of the complete ignition system, including the connecting parts set, should always be used to avoid **destruction and incorrect measurement.**

  The conductor cross-sections (1.5–) given in the terminal diagram must be observed and a maximum length of 1.5 m not exceeded.

  The lead from ignition transformer term. 1 and the – ve lead from the voltage stabilizer must be connected together to trigger box term. 31/1 to prevent incorrect triggering.

- The measurements must be made at room temperature.

- It is important that the measurements be made at the respective voltage specified.

- The ignition distributor specified for the test must be checked at regular intervals in accordance with the prescribed ignition distributor test instructions.

- No devices such as suppression capacitor, timing light, test lamp etc. may be connected to terminal "A" of the ignition transformer, since up to 450 V may be present on terminal "A".

  Even after the trigger box has been switched off (no voltage), terminal "A" must not come into contact with ground. Such action results in the destruction of electronic components.

3. Preparations for Testing

3.1 Voltage Divider for User-fabrication

The following parts are needed:

1 potentiometer	20 kΩ, 1/3 W	(linear)
1 resistor	620 Ω, 1/3 W	± 5%

Connect parts electrically, see Fig. 1.

Note: To simplify testing, the voltage divider can be permanently mounted on a board and equipped with terminals.

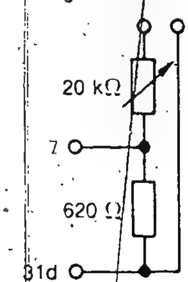


Figure 1 Voltage divider

B18

8 A1

1 = Trigger box
2 = Ignition distributor
3 = Voltage divider
4 = Ignition transformer with 1 kΩ suppressor
5 = Ignition-distributor test bench
6 = Different ignition-distributor connectors (note position of the long orientation lugs, see arrow)
7 = Voltage stabilizer
8 = Oscilloscope

approx. 400 V

approx. 25 kV

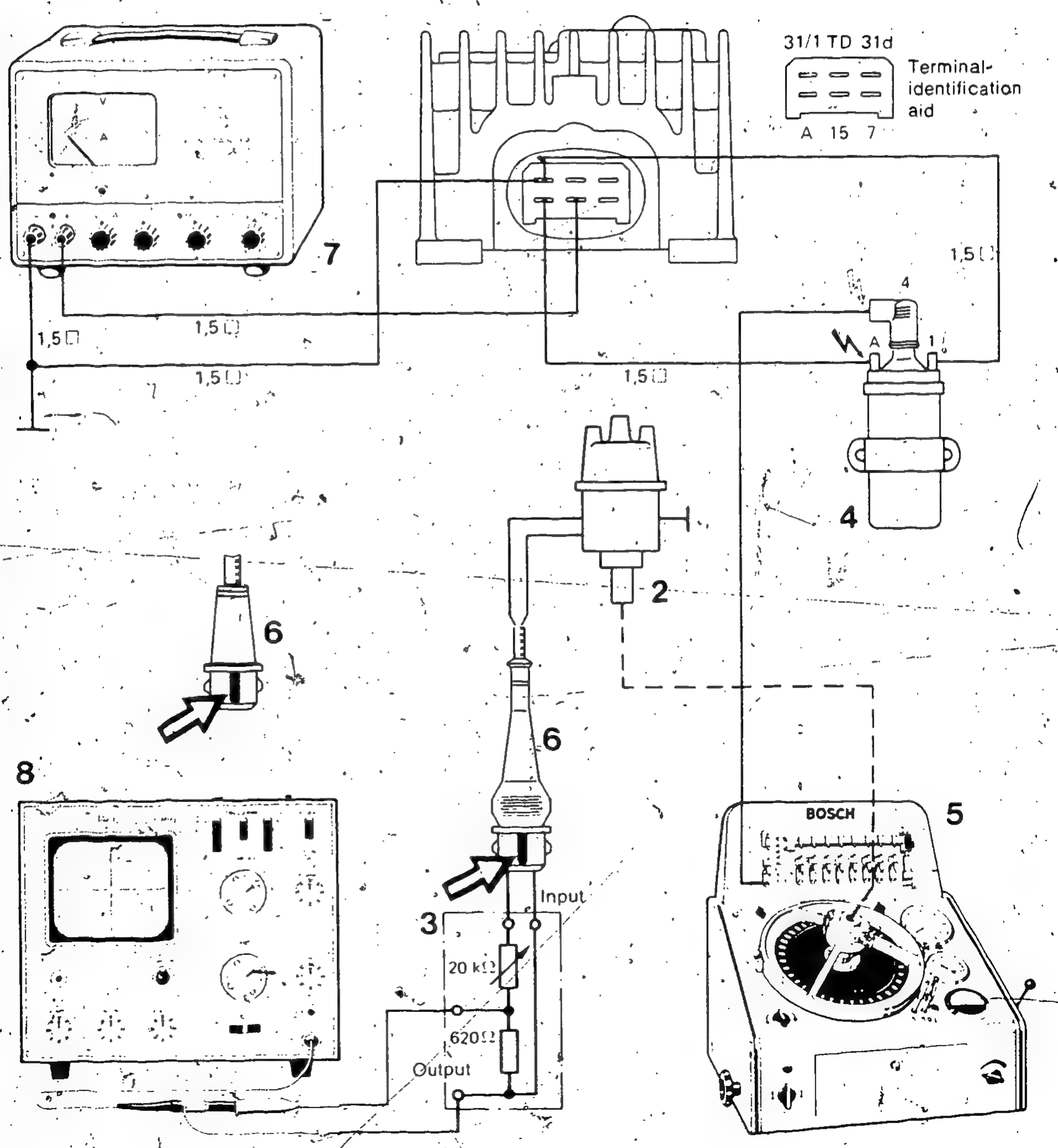


Figure 2 Connection Diagram

B19 119

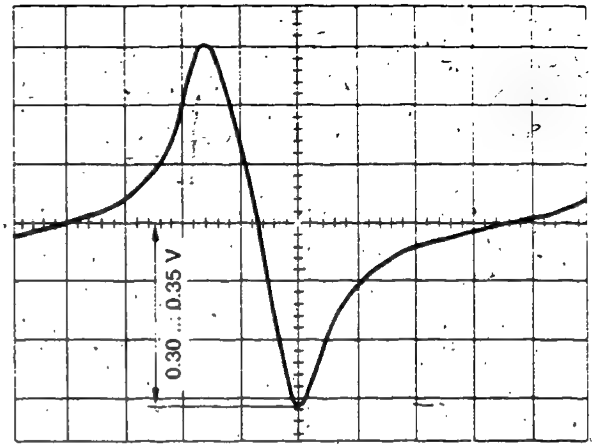
3.2 Set Up Complete Ignition System

Switch on the voltage stabilizer and set to 14 V.
Switch off stabilizer.
Set up ignition system, testers, including the voltage divider, (see section 1 for parts) and connect electrically in accordance with the connection diagram, Fig. 2.

Important!
Make sure there is a ground connection between the voltage stabilizer and the ignition distributor. Connect high-tension terminal 4 of the ignition distributor to the **permanently adjusted spark gap** on the ignition-distributor test bench.

3.3 Set the Threshold Voltage

Using the appropriate flange, clamp the ignition distributor to the EFZV 10 ignition distributor test bench and drive at a speed of 250 min⁻¹.
Connect the ignition distributor to the voltage divider input (Fig. 2).
Connect the oscilloscope (voltage divider 1:1) to the output of the user-fabricated voltage divider, and turn the voltage divider potentiometer until the oscilloscope reads 0.3 ... 0.35 V, the **negative** half-wave being measured; see Fig. 3.
Note: The speed of the ignition distributor test bench must be continually checked and corrected as needed during the following measurement.



Settings:
y = 0.1 V/major division
x = 5 ms/major division
0.30 ... 0.35 V.

Figure 3 Threshold Voltage

8 20

4. Testing

4.1 Test the Input Stage

Disconnect the oscilloscope from the voltage divider output. Connect the output to the trigger box (do not mix up terminals), Fig. 4.
Switch on the voltage stabilizer and set to 14 V.
The ignition spark must now be visible at the spark gap. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer.

1 = Trigger box
2 = Ignition distributor
3 = Voltage divider
4 = Ignition transformer with 1 kΩ suppressor
5 = Ignition-distributor test bench
6 = Different ignition-distributor connectors (note position of the long orientation lugs, see arrows)
7 = Voltage stabilizer

approx. 400 V

approx. 25 kV

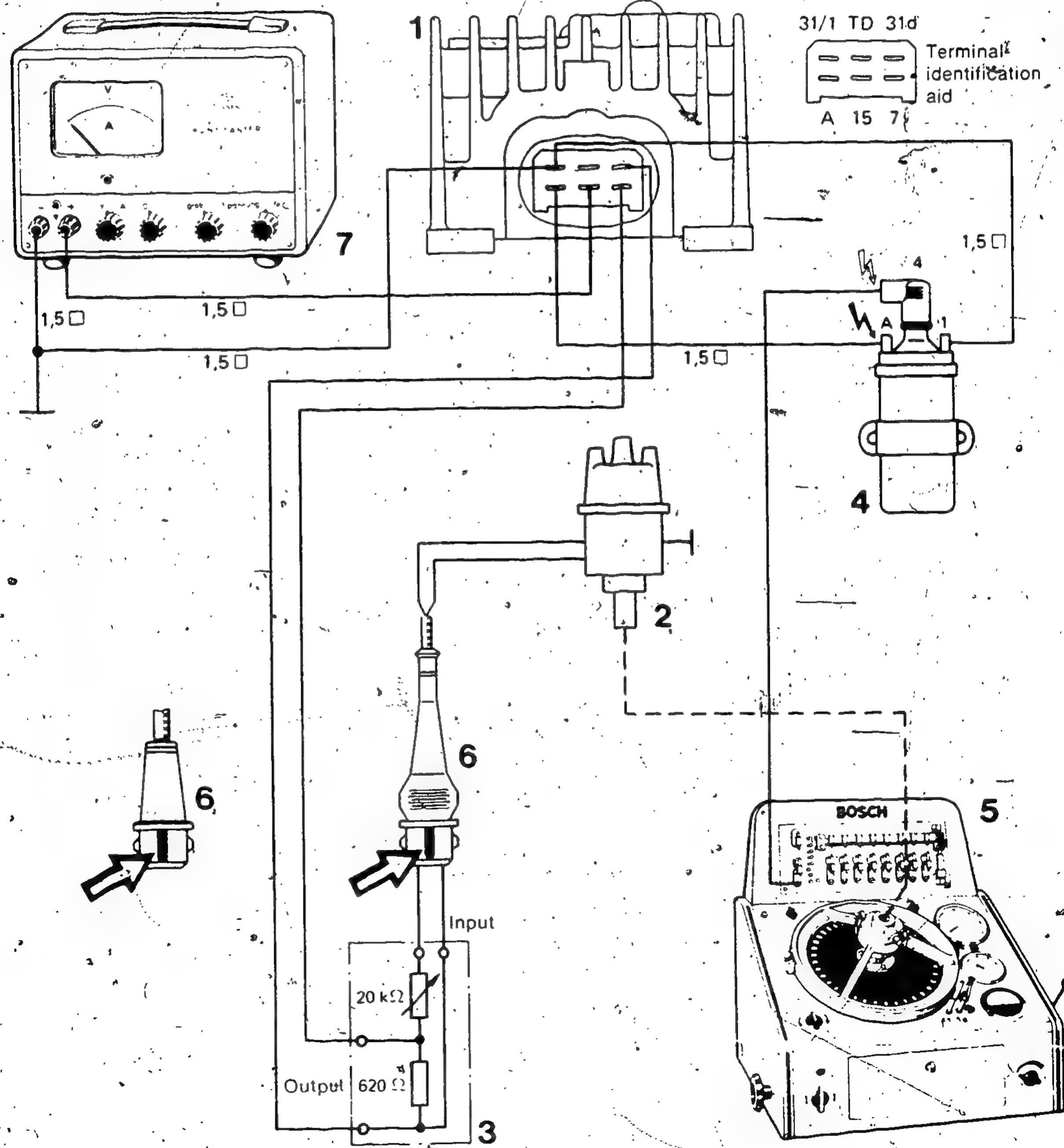


Figure 4 Connection Diagram

4.2 Test the Power Stage

Remove the voltage divider and connect the ignition distributor directly to the trigger box. Fig. 5. Connect the oscilloscope (voltage divider 1:10) to trigger box terminal A and terminal 31/1 as per Fig. 5.
Drive the ignition distributor at a rotational speed of 1000 min⁻¹.
Switch on the voltage stabilizer and set it to 14 V.
Sparks must be present in the spark gap.

1 = Trigger box
2 = Ignition distributor
4 = Ignition transformer with 1-kΩ suppressor
5 = Ignition-distributor test bench
6 = Different ignition-distributor connectors (note position of the long orientation lugs, see arrows)
7 = Voltage stabilizer
8 = Oscilloscope

approx. 400 V

approx. 25 kV

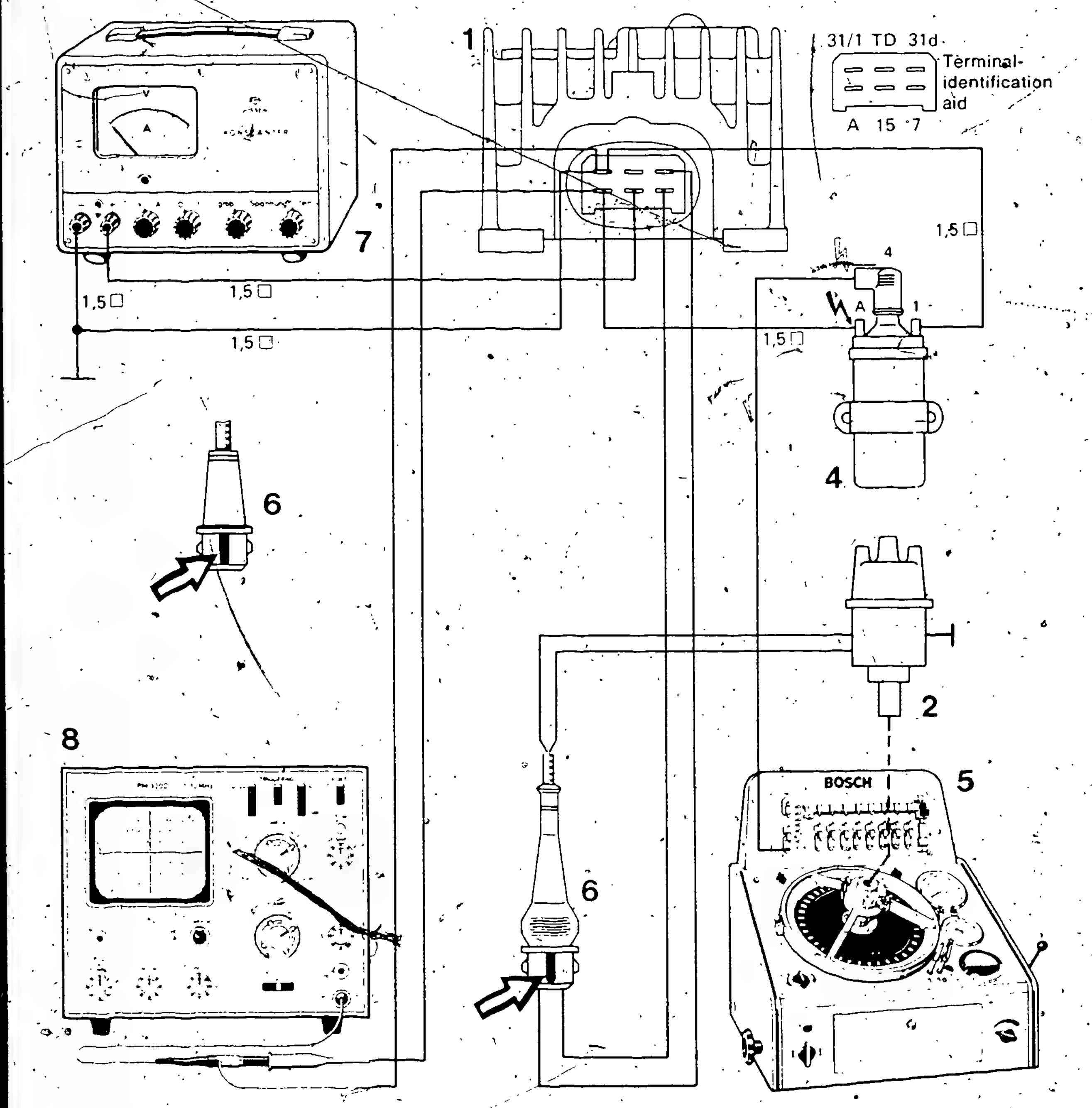
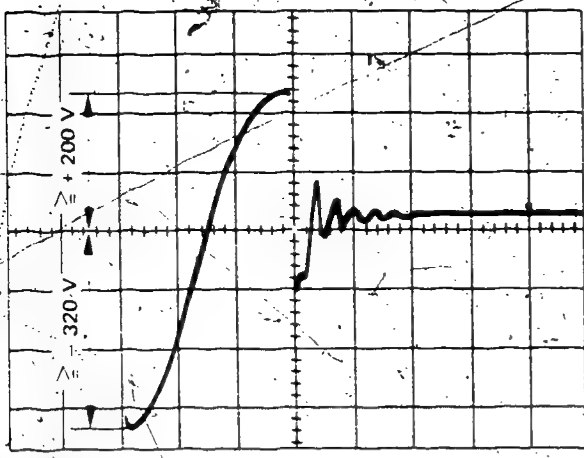


Fig. 5 Connection diagram



The oscilloscope display must correspond to that shown in Fig. 6. If it does not, the trigger box is defective. Switch off the voltage stabilizer.

Settings:
y = 10 V/major division
x = 10 µs/major division

Figure 6 Charging voltage

W-22713u

4.3 Test the Operation of the Tachometer

Connect the resistance of 10 kΩ on term. TD of the trigger box to the voltage stabilizer as per Fig. 7.
Connect the oscilloscope with a 1:1 voltage divider on term. TD of the trigger box to ground as per Fig. 7.
Drive the ignition distributor at a rotational speed of 1000 min^{-1}.
Switch on the voltage stabilizer and set it to 14 V.

1 = Trigger box
2 = Ignition distributor
4 = Ignition transformer with 1 kΩ suppressor.
5 = Ignition-distributor test bench
6 = Different ignition-distributor connectors (note position of the long orientation lugs, see arrows)
7 = Voltage stabilizer
8 = Oscilloscope
9 = Resistor 10 kΩ

approx. 400 V

approx. 25 kV

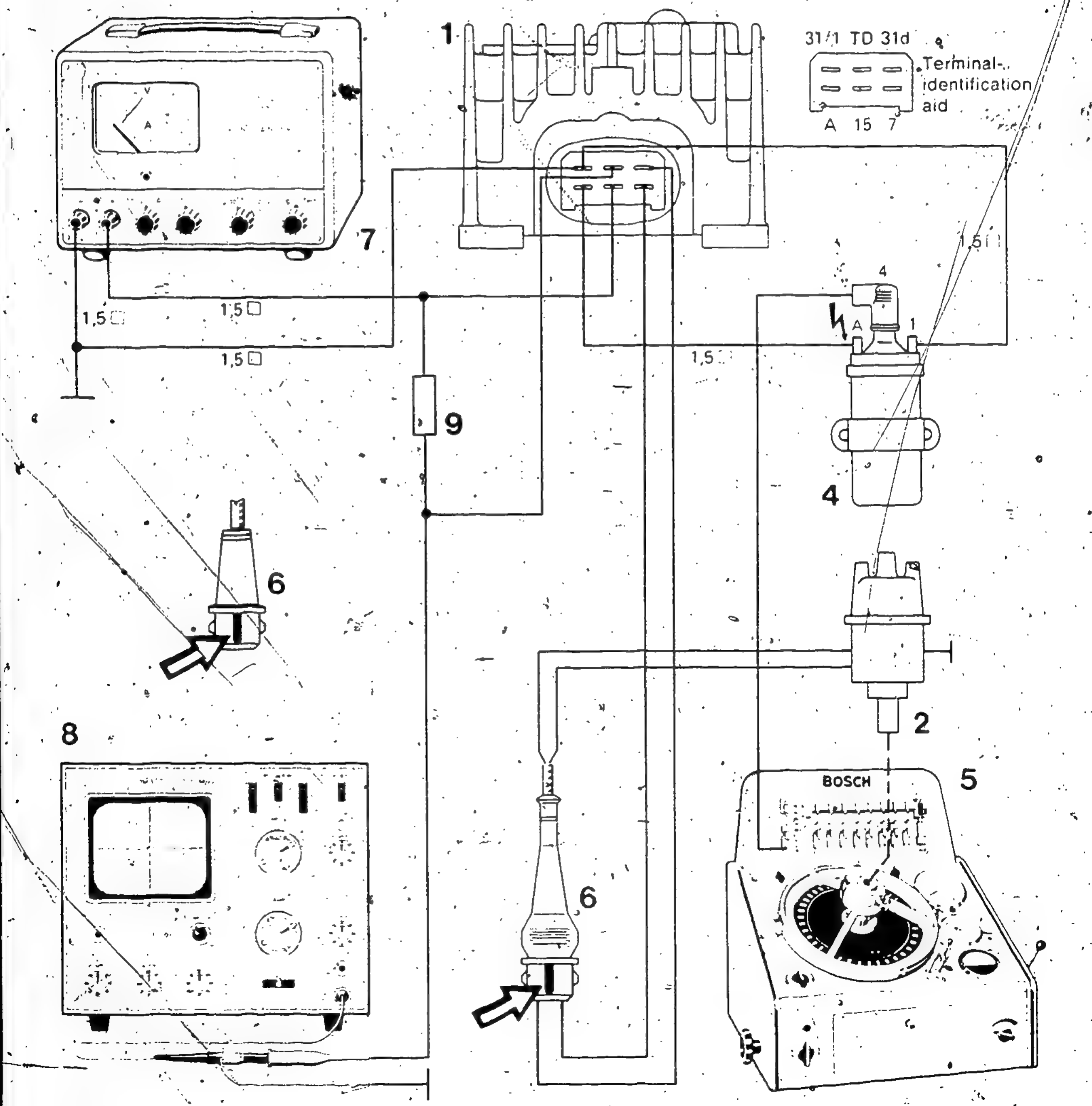
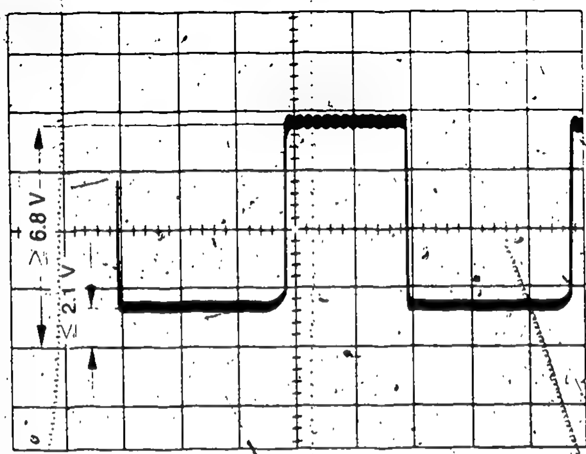


Fig. 7 Connection diagram

B24

24

The oscilloscope display must correspond to Fig. 8.
If it does not, the trigger box is defective.
Switch off the voltage stabilizer.



Settings:
y = 2.0 V/major division
x = 2 ms/major division

Fig. 8 Rotational-speed pulse

4.4 Operating Test at 6 Volts
Switch on the voltage stabilizer and set to 6 V.
Switch off the stabilizer.
Drive the ignition distributor at a speed of approx. 100 min^{-1}.
Switch on the voltage stabilizer.
If the trigger box is not defective, sparks must be visible at the spark gap. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer.

B 25

B25

0 231..

VDT-1-231/1000 B
Ed. 1 10.1975
Translation of German edition of 13. 10. 1975

User-fabrication of the adapter lead for the distributor test bench EFZV 10

1. General

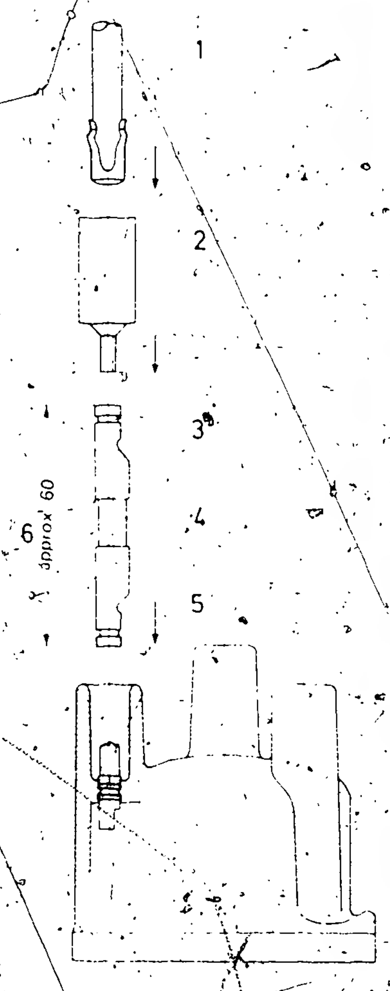
The partial introduction (by VW, Audi, Mercedes-Benz) of new high-voltage termination techniques on the distributor cap means that such distributors cannot be tested on the distributor test bench EFZV 10 without using adapter leads. The following items are required:

2. Adapter lead manufacture

2.1 Taking by-the-yard ignition cable (Part No. 6 181 090 100), cut off 9 pieces of ignition cable to the prescribed length (see Fig.).

2.2 Using pliers, crimp terminals (Part No. 8 780 499 000) to the ends of the pieces of ignition cable.

2.3 Connect adapter (Part No. 1 684 489 003) to the adapter lead.



1 Ignition cable from EFZV 10
2 Adapter
3 Terminal
4 Ignition cable
5 Terminal stud (High-voltage terminal)
6 Adapter lead

In case of enquiry, please contact your authorized representative.

Published by:
Trade Division KH
After-sales Service Training Center KH/VSK

BOSCH
Geschäftsbereich KH Kundendienst Kfz-Ausrüstung
by Robert Bosch GmbH D-7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

IGNITION SAFEGUARD WITH IGNITION DISTRIBUTORS 0 231 178 016 .. 017

VDT-I-231/102 En
4.1980

VOLVO - PENTA Marine engines

RISK OF ACCIDENT

General

The US Coast Guard Regulations for gasoline-driven boat engines demand a so-called "ignition safeguard " in the products for the electrical engine equipment (including the ignition distributor). This is to make sure that explosions do not occur when operated in a combustible atmosphere.

"Ignition safeguard" characteristics

The following special precautions have been introduced in ignition distributors with "ignition safeguard":

- bolted distributor cap without ventilation slots, but with 2 plugs with labyrinth ventilation in the upper part of the housing;
- round primary cable lead-through instead of rectangular;
- perforated plate and metal strainer ring in the lower part of the housing for sealing the housing ventilation holes (recognizable from below through the ventilation bores).

Up to FD 932 the distributor housing has a recess for an O-ring. From FD 041 the O-ring between the distributor housing and the distributor cap is dispensed with and with it the recess in the distributor housing.

Workshop instructions

During all repair work on ignition distributors with a recess for an O-ring in the distributor housing, care should be taken to see that a missing or damaged O-ring is replaced.

When repairs are carried out you should check to see that the special precautions described in the section "Ignition safeguard characteristics" are fitted. There should be no additional holes or openings in the ignition-distributor housing or in the distributor cap.

REPAIR PARTS SETS

VDT-I-237/101 En

10.1982

for breakerless ignition distributors
ZV-H and ZV-I
0 237 ..

Repair parts sets and individual service parts are available for repairing all breakerless ignition distributors. These sets and parts are listed in the service parts microfiches EE*.

* See service parts microfiche EE 00 under 0 237 ...
Tools, repair and test instructions and test specifications are available for such repairs.

ZV-H (ignition distributor with Hall generator)

Repair parts set consisting of:

- magnetic pulse generator (ignition vane switch)
- trigger wheel
- socket
- fastening parts

Repair parts set	Ignition-distributor type
1 237 011 050	dia. 65, 4 cyl.
051	dia. 65, 4 cyl. short type
052	dia. 65, 5 cyl.
053	dia. 65, 5 cyl.
054	dia. 65, 4 cyl.
055	dia. 65, 4 cyl.
056	dia. 65, 4 cyl.
057	dia. 65, 4 cyl.
058	dia. 65, 4 cyl. short type
059	dia. 80, 6 cyl.
060	dia. 80, 6 cyl.
061	dia. 65, 4 cyl.
062	dia. 65, 4 cyl. short type

Tools necessary:

- clamping fixture KDZV 7221 (for clamping the ignition-distributor)
- puller KDZV 7224 (for pulling off the trigger wheel of short-type ignition distributors).

To be obtained from KH/VKD 4.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung
© by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50. Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

ZV-I (ignition distributor with induction-type pulse generator)

1. Repair parts set "ignition-distributor connection" consisting of:
   - socket
   - bracket
   - seal
   - fastening parts

Repair parts set	Ignition-distributor type
1 237 010 015	dia. 65 mm, long type
016	dia. 65 mm, short type
017	dia. 80 mm
018	dia. 80 mm
020	dia. 65 mm
021	dia. 65 mm, short type
022	dia. 80 mm.

2. Repair parts set "timer core" consisting of:
   - timer core
   - seal
   - fastening parts

Repair parts set	Ignition-distributor-type
1 237 011 030	dia. 65 mm, 4 cyl.
031	dia. 65 mm, 5 cyl.
032	dia. 65 mm, 6 cyl.
033	dia. 80 mm, 4 cyl.
034	dia. 80 mm, 6 cyl.
035	dia. 80 mm, 6 cyl.
036	dia. 90 mm, 6 cyl. non symmetrical
037	dia. 90 mm, 8 cyl.

Necessary tools:

- clamping fixture KDZV 7221 (for clamping the ignition distributor)
- location rings KDZV 7222 and KDZV 7223 (for locating the magnetic pulse generator)
- puller KDZV 7224 (for pulling off the timer core of short-type ignition distributors).

To be obtained from KH/VKD 4.

Repair and test instructions for:
ZV-H, 65 mm housing dia.: microfiche W-237/500 of 5.1982
ZV-H, 80 mm housing dia.: microfiche W-237/501 of 5.1982
ZV-I, 65 mm housing dia.: microfiche W-237/502 of 6.1982
ZV-I, 80 and 90 mm housing dia.: microfiche W-237/503 of 6.1982

Index of test specifications: microfiche W-237/1000, 82/2
Test specifications: microfiche W-237/1001..., 82/2

Please note: The part numbers of the repair parts sets listed are up to date and can be used for stockpiling in stores. The list will not be brought up to date in the event of any alterations to the part numbers.

C1

0 237 303 ..

0 237 304 ..

VDT-I-237/1000 En

11.1979

Clamping flange for

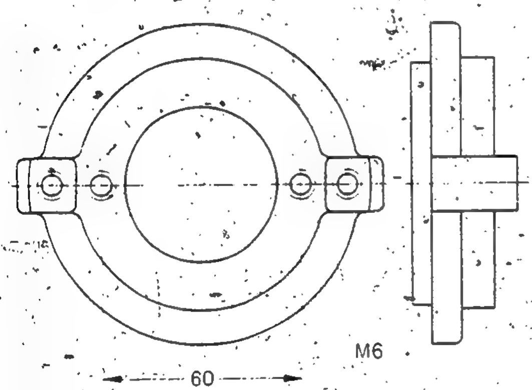
breakerless ignition distributor

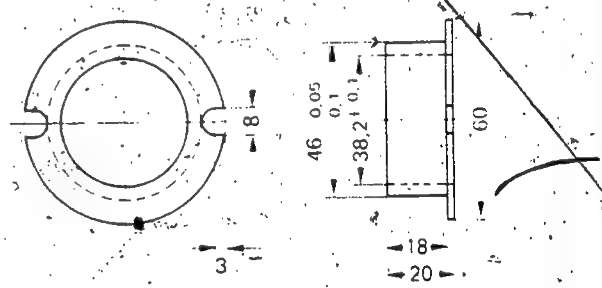
(Alfa Romeo V6 2500)

A suitable clamping flange is not available for clamping the breakerless ignition distributor 0 237 303 .. and 0 237 304 ..., fitted in the Alfa Romeo V6 2500, to the ignition-distributor test benches EFZV 10 and ZVS 001.00.

We suggest the following solution in order to clamp these distributors to the test benches.

2 new M6 holes for the clamping screws are drilled in the clamping flange 1 685 700 006 (see sketch) with pilot diameter 46 mm (used for the ignition distributor 0 231 309 .. - BMW 316, 318, 320). In addition, a sleeve is to be manufactured as per the drawing.





Clamping flange 1 685 700 006

Sleeve, user manufactured

BOSCH

Geschäftsbereich KH Kundendienst Kfz-Ausrüstung
© by Robert Bosch GmbH D-7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

C2

After-sales Service Instructions

Testing **22**

VDT-W-227/307 En
Ed. 2

Breakerless Inductive Semiconductor Ignition (TCI-h)

with trigger box 0 227 100 011 . . . 028

BOSCH After-sales Service
Automotive
Equipment

C3

Table of Contents

Caution!

High-energy ignition system. Dangerous primary and secondary voltages.

Please take note of our technical bulletin VDT-I-227/102 B

Automotive Equipment – After-sales Service
Department for Technical Publications KH VDT
Postfach 50, D-7000 Stuttgart 1

Please direct questions and comments concerning the contents to our authorized representative in your country

Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne
par Robert Bosch GmbH
(3.78)

C4

W-2271302
Seite 3

1. Test Equipment and Other Parts Required

Voltage stabilizer 20 V/15 A	commercial type
Precision oscilloscope, for example Hameg 312 (with probe 1 : 10)	commercial type
or	
Philips PM 3200 (with probe 1 : 10)	commercial type
Distributor test bench EFZV 10	0 680 123 001
Voltmeter (3-V scale), for example EFAW 226	0 681 102 800
Spark gap (ignition coil and condenser tester) EFAW 106 A	0 681 100 001
or	
Single spark gap EF 1177/7	1 684 531 000
Complete ignition system, consisting of:	
1 Trigger box (test specimen)	0 227 100 011
or	0 227 100 028
1 Set of connector parts for trigger box (1 protective cap, 1 male connector, 6 blade receptacles)	2 227 000 106
4- or 6-cylinder ignition distributor	0 231 ...
Hall generator (set of parts, retrofitted)	1 237 021 ...

Note: the complete set of parts matched to the ignition distributor in question is given in the Sales Documentation.

Instructions for installing the Hall generator see Technical Bulletin VDT-I-231 101 B

1 Ignition coil	0 221 122 009
2 Ignition-cable terminals for the ignition coil	1 901 353 126
1 Ballast resistor 0.4 0.6 Ω	0 227 900 101
or 0.6 0.6 Ω	0 227 900 102
2 Blade receptacles for ballast resistor	1 901 355 881
About 1.5 m of cable, 1.5 mm², for example	6 210 150 150

2. Workshop Information

In order to avoid **destruction** of system components and **incorrect measurements**, the specified parts from a complete ignition system, including the set of connector parts, must be used.

If the polarity is incorrect when the parts are connected together, the ignition vane switch and the trigger box will be destroyed.

Measurements must be made at room temperature.

It is important that the measurements be made with the voltage specified in each case.

The ignition distributor specified for the testing must itself be tested at regular intervals according to the ignition distributor testing instructions.

During the entire testing procedure the **spark gap** must be connected and must be **set to a gap of 8 mm.**

3. Preparations for Testing

3.1 Assemble Complete Ignition System

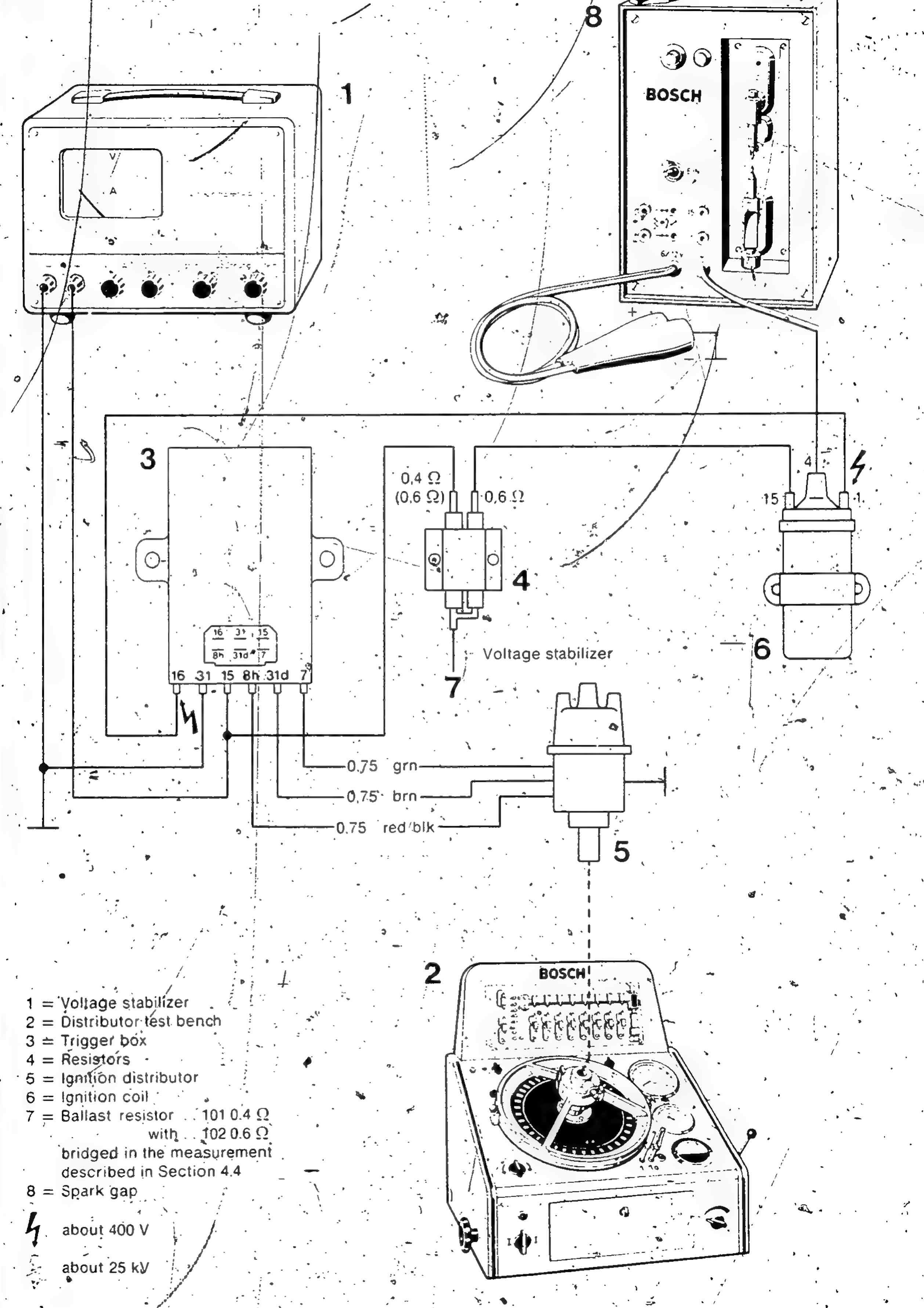
Switch on the voltage stabilizer, set it to 14 V, and then switch it off.
Assemble the ignition system and testing equipment (see Section 1 for parts), and connect them electrically as shown by the wiring diagram, Fig. 1.

Note: a 4- or 6-cylinder ignition distributor with a retrofitted Hall generator is required to operate the trigger box (see Section 1).
Connect the spark gap **black clip to minus.** Do not connect the red clip. Connect the high-voltage cable (terminal 4 on the spark gap unit) and terminal 4 on the ignition coil.

C5

W-2271307
Seite 4

Fig. 1 Wiring diagram



1 = Voltage stabilizer
2 = Distributor test bench
3 = Trigger box
4 = Resistors
5 = Ignition distributor
6 = Ignition coil
7 = Ballast resistor . . 101 0.4 Ω
with . . 102 0.6 Ω
bridged in the measurement described in Section 4.4
8 = Spark gap

about 400 V

about 25 kV

C6

4. Testing

4.1 Test Transistorized Output Stage (Zener Voltage)

Clamp the ignition distributor to distributor test bench EFZV 10 using a suitable flange and drive it at 250 rev/min.

Connect the oscilloscope with the 1 : 10 probe (balance the voltage divider) to terminal 1 on the ignition coil and to ground.

Set the spark gap to 8 mm.

Switch on the voltage stabilizer and set it to 14 V.

A spark must be present at the spark gap. The oscilloscope display must correspond to Fig. 2. It is important there that the amplitude of the voltage shown is 300–360 V.

If this is not the case, the trigger box is defective.

Switch off the voltage stabilizer and disconnect the oscilloscope.

4.2 Test Transistor Output Stage ($U_{CE(sat)}$)

Do not drive the ignition distributor. Remove the distributor cap and the dust-protection cover. Turn the distributor by hand until the vane is positioned completely in the air gap of the ignition vane switch. See Fig. 3

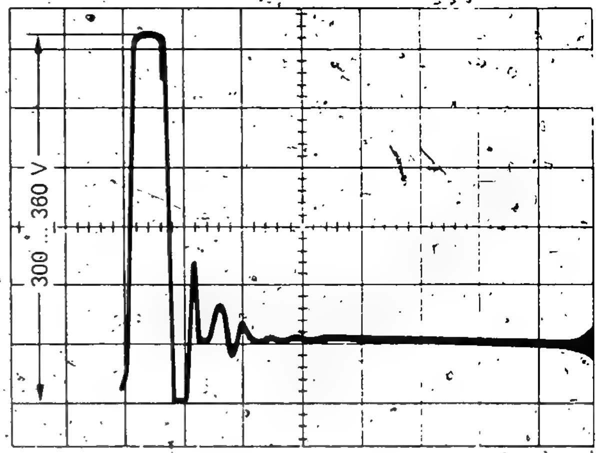
Connect the voltmeter (measurement range 3 V) between terminal 1 on the ignition coil and ground.

Switch on the voltage stabilizer and set it to 14 V.

With a good trigger box, the voltmeter must read 0.5 ... 2.0 V. If the reading is outside these limits, the trigger box is defective.

Switch off the voltage stabilizer.

Replace the dust-protection cover and the distributor cap and fasten them in place.



Settings:
y = 50 V/scale division
x = 50 μs/scale division

Fig. 2 Transistorized output stage zener voltage

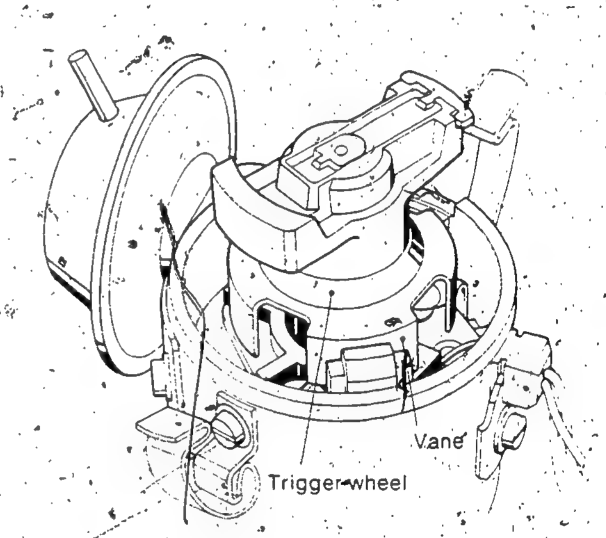


Fig. 3 Vane in air gap

W-227130

4.3 Test Hall Generator Supply Voltage (Terminal 8h)

Do not drive the ignition distributor.
Connect the voltmeter between trigger box plugs 8h and 31d.
Switch on the voltage stabilizer and set it to **exactly** 14 V.
With a good trigger box, the voltmeter must read 12.0 – 13.5 V. If this is not the case, the trigger box is defective.

4.4 Operational Test at 7 Volts

Switch on the voltage stabilizer, set it to 7 V, then switch it off.
Bridge the ballast resistor according to the wiring diagram, Fig. 1, Part 7.

Set the spark gap to 8 mm.

Drive the ignition distributor at a speed of about 100 rev/min.

Switch on the voltage stabilizer.

Caution: when the ballast resistor is bridged, the applied voltage must not exceed 10 V (at a higher voltage the trigger box will be destroyed). With a good trigger box, sparks must be present at the spark gap. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer.

C8

After-sales Service Instructions

Testing **22**

VDT-W-227/309 B
Ed. 1
supersedes VDT-WPE 125/102 B

Inductive Semiconductor Ignition (TCI-k)

with Trigger Box 0 227 051 014
. . 024

BOSCH After-sales Service
Automotive
Equipment

C9

Caution!

High-energy ignition system. Dangerous primary and secondary voltages.

Please take note of our technical bulletin VDT-I-227/102 B

1. Test equipment

Voltmeter	e.g.	EFAW 120 A	0 681 100 201
Ignition-coil and condenser tester		EFAW 106 A	0 681 100 001
or			
Single spark gap		EF 1177/7	1 684 531 000
Ignition coil tester		EFMZ 1 A	0 681 120 001
Ohmmeter	e.g.	Pontavi	commercially available

2. Instructions for working on the TCI-k in the workshop

The ignition coil for inductive semiconductor ignition must not be replaced by a conventional ignition coil or connected as such.

Non-observance of the following points will result in destruction of the trigger box.

When connecting the battery observe the **correct polarity** (negative terminal to ground).

Do not interchange the leads connected to the trigger unit.

Automotive Equipment — After-sales Service
Department for Technical Publications KH VDT
Postfach 50, D-7000 Stuttgart 1

Please direct questions and comments concerning the contents to our authorized representative in your country.

Printed in the Federal Republic of Germany.

Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.
(2.77)

W-2271309

3. Testing the trigger box

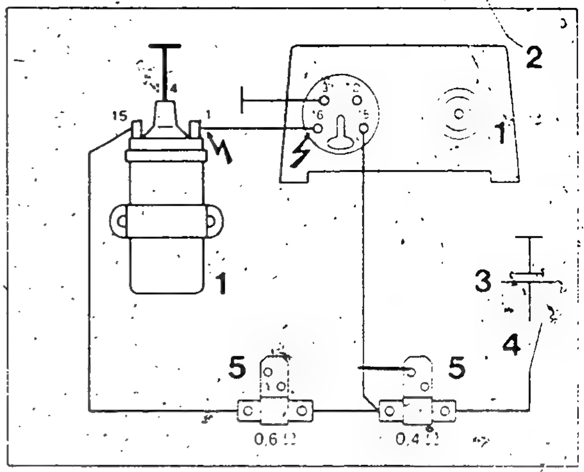
3.1 Assembly of the TCI-k equipment

Completely assemble the equipment and connect electrically (Fig. 1).

In order to avoid contact resistances and short circuits, the trigger box must be connected with:

4-pole connecting plug, Mercedes Benz,
Part No. 114 540 2609 and
1-pole connecting plug, Mercedes Benz
Part No. 001 156 2101 or
Eisemann pin plug, Part No. 8 781 355 000

Further, to ensure reliable measurements, the battery voltage must be the specified 11 to 13 V.



1

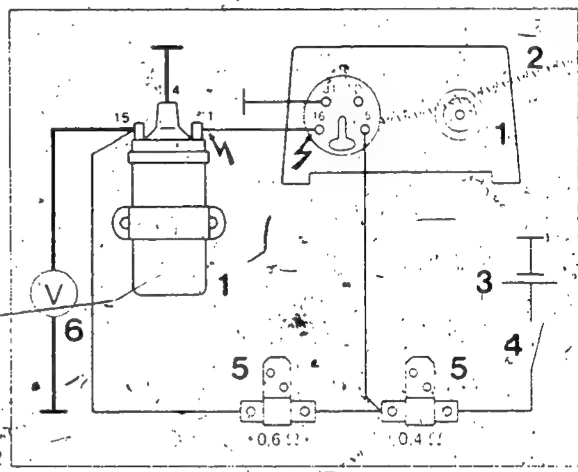
3.2 Voltage readings when transistors not conducting

(testing blocking performance of transistors)

Instrument:
Voltmeter with 0.1 volt scale divisions
(e.g. EFAW 120 A).

Connect voltmeter to terminal 15 of the ignition coil (Fig. 2).

Switch on voltage source.
The voltmeter must indicate the voltage of the battery. If not the transistors are not blocking and the trigger box must be replaced.



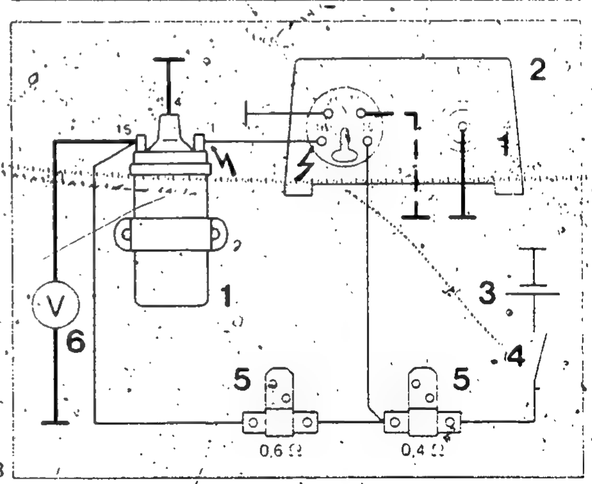
2

3.3 Voltage readings when transistors conducting

So that no internal voltage flashovers occur in the ignition coil (insulation damage), the secondary side is to be connected to ground. Connect voltmeter to terminal 15 of the ignition coil (Fig. 3).

Switch on voltage source. The voltage must be 3.6 . . . 4.8 V when terminal 7 of the trigger box is connected to ground.
If not, renew the trigger box.

Testing TD terminal (diagnosis):
Disconnect terminal 7 from ground and make ground connection to terminal TD. The same readings as previously must be attained.



3

1 = Ignition coil		0 221 122 001
2 = Trigger box		0 227 051 014 . . . 024
3 = Battery		
4 = Ignition switch		
5 = Series resistor	0.4 ohm	0 227 901 012
	0.6 ohm	0 227 901 013
6 = Voltmeter		

C11

After-sales Service Instructions

Testing

22

VDT-W-227/302 En
Ed. 2

Breakerless Transistorized Ignition System (TCI-i)

with trigger box 0227100005...018

BOSCH After-sales Service Automotive Equipment

C12

Table of Contents

Caution!

High-energy ignition system. Dangerous primary and secondary voltages.

Please take note of our technical bulletin VDT-I-227/102 En.

Automotive Equipment – After-sales Service
Department for Technical Publications KH/VDT
Postfach 50, D-7000 Stuttgart 1

Please direct questions and comments concerning the contents to our authorized representative in your country.

Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.
(6 1978)

1. Testers and Auxiliary Materials Required

Voltage stabilizer ≧ 20 V/15 A commercially available	
Precision oscilloscope, e. g. Hameg 312 (with probe 1:1 and 1:10)	commercially available
or	
Philips PM 3200 (with probe 1:1 and 1:10)	commercially available
Ignition distributor test bench EFZV 10	0 680 123 001
Dwell-angle tester, e. g. EFAW 226	0 681 102 800
Voltmeter (3 V scale), e. g. EFAW 226	0 681 102 800
Spark gap (ignition coil and condenser tester EFAW 106 A)	0 681 100 001
or	
Single spark gap EF 1177/7	1 684 531 000
Complete ignition system consisting of:	
Trigger box (test specimen)	0 227 100 005 or 0 227 100 018
Ignition distributor (4 cyl., 1.1 kΩ pulse generator)	0 237 001 001
or	0 237 002 001
or	0 237 002 002
Ignition coil (KW 12 V)	0 221 122 002
Ballast resistor (0.9 Ω)	0 227 900 002
Connecting parts set (for the trigger box) consisting of:	2 227 000 100
1 protective cap, 1 plug connector, 6 contact springs	
approx. 1.5 m cable, 1.5 mm², e. g.	6 210 150 150
2 ignition-cable terminals for the ignition coil 5 mm dia.	1 901 353 126
2 blade receptacles for ballast resistor	1 901 355 881
1 potentiometer 20 kΩ-1/3 W (linear)	commercially available
1 resistor 1.2 kΩ-1/3 W ± 5 %	commercially available

2. Workshop Instructions

- Specified parts of the complete ignition system, including the connecting parts set, should always be used to avoid **destruction** and **incorrect measurement.**
- The measurements must be made at room temperature.
- It is important that the measurements be made at the respective voltage specified.
- The ignition distributor specified for the test must be checked at regular intervals in accordance with the prescribed ignition distributor test instructions.
- The spark gap must be connected and **set to 8 mm** for the entire measuring procedure. The spark gap must be in perfect condition.

3. Preparations for Testing

3.1 Making Your Own Voltage Divider

The following parts are needed:

1 potentiometer 20 kΩ-1/3 W (linear)
1 resistor 1.2 kΩ-1/3 W ± 5 %

Connect parts electrically, see Fig. 1.

Note: To simplify testing, the voltage divider can be permanently mounted on a board and equipped with appropriate terminals.

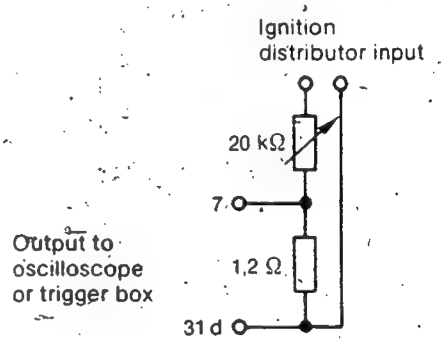
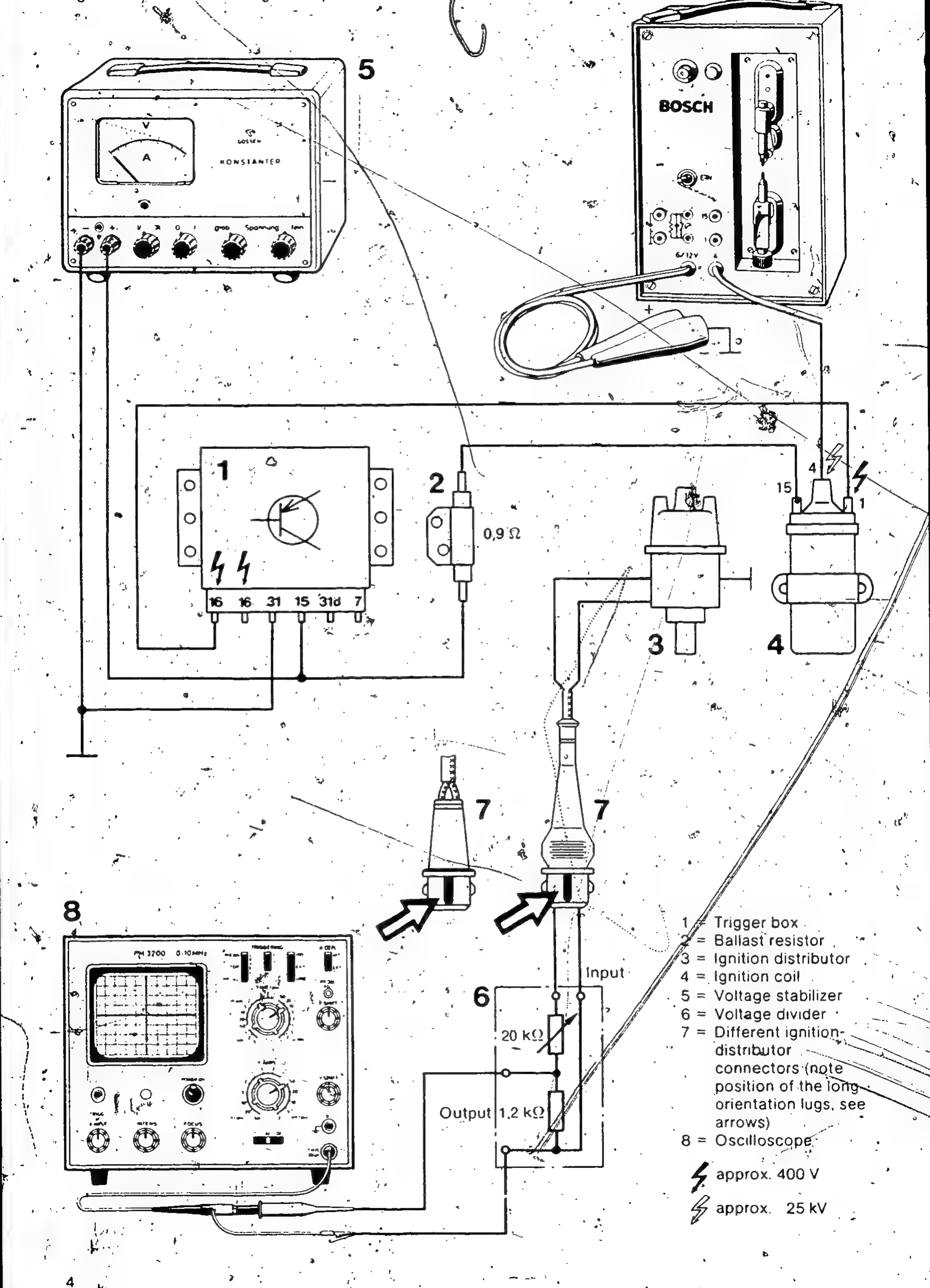


Figure 1 . Voltage divider

Figure 2 Connection Diagram



1 = Trigger box
2 = Ballast resistor
3 = Ignition distributor
4 = Ignition coil
5 = Voltage stabilizer
6 = Voltage divider
7 = Different ignition-distributor connectors (note position of the long orientation lugs, see arrows)
8 = Oscilloscope

approx. 400 V

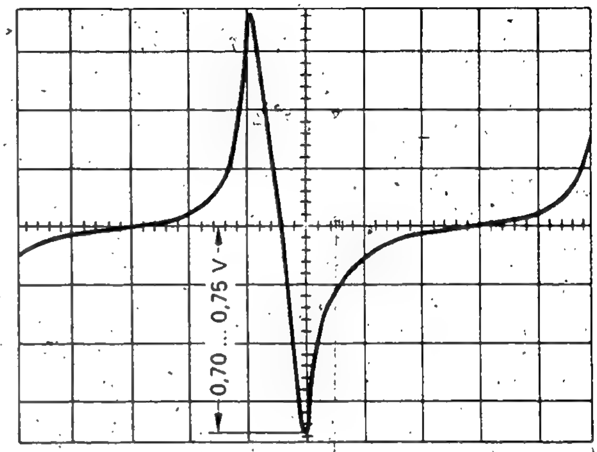
approx. 25 kV

3.2 Set Up Complete Ignition System

Switch on the voltage stabilizer and set to 14 V. Switch off stabilizer.
Set up ignition system, testers, including the voltage divider, (see section 2 for parts) and connect electrically in accordance with the connection diagram, Fig. 2.
Connect the spark gap: **black clip to negative;** do not connect red clip. Connect high-tension cable (terminal 4) to the ignition coil (terminal 4).

3.3 Set the Threshold Voltage

Using the appropriate flange, clamp the ignition distributor into the EFZV 10 ignition-distributor test bench and drive at a speed of 250 min^{-1}.
Connect the ignition distributor to the voltage divider input (Fig. 2). Connect the oscilloscope with the probe on 1:1 to the voltage divider output, and turn the potentiometer of the voltage divider until the oscilloscope reads 0.70 . . . 0.75 V, the **negative** half-wave being measured; see Fig. 3.
Note: The speed of the ignition-distributor test bench must be continually checked and corrected as needed during the following measurement.



Settings:
y = 0.2 V/major division
x = 10 ms/major division
0.70 . . . 0.75 V

Figure 3 Threshold Voltage

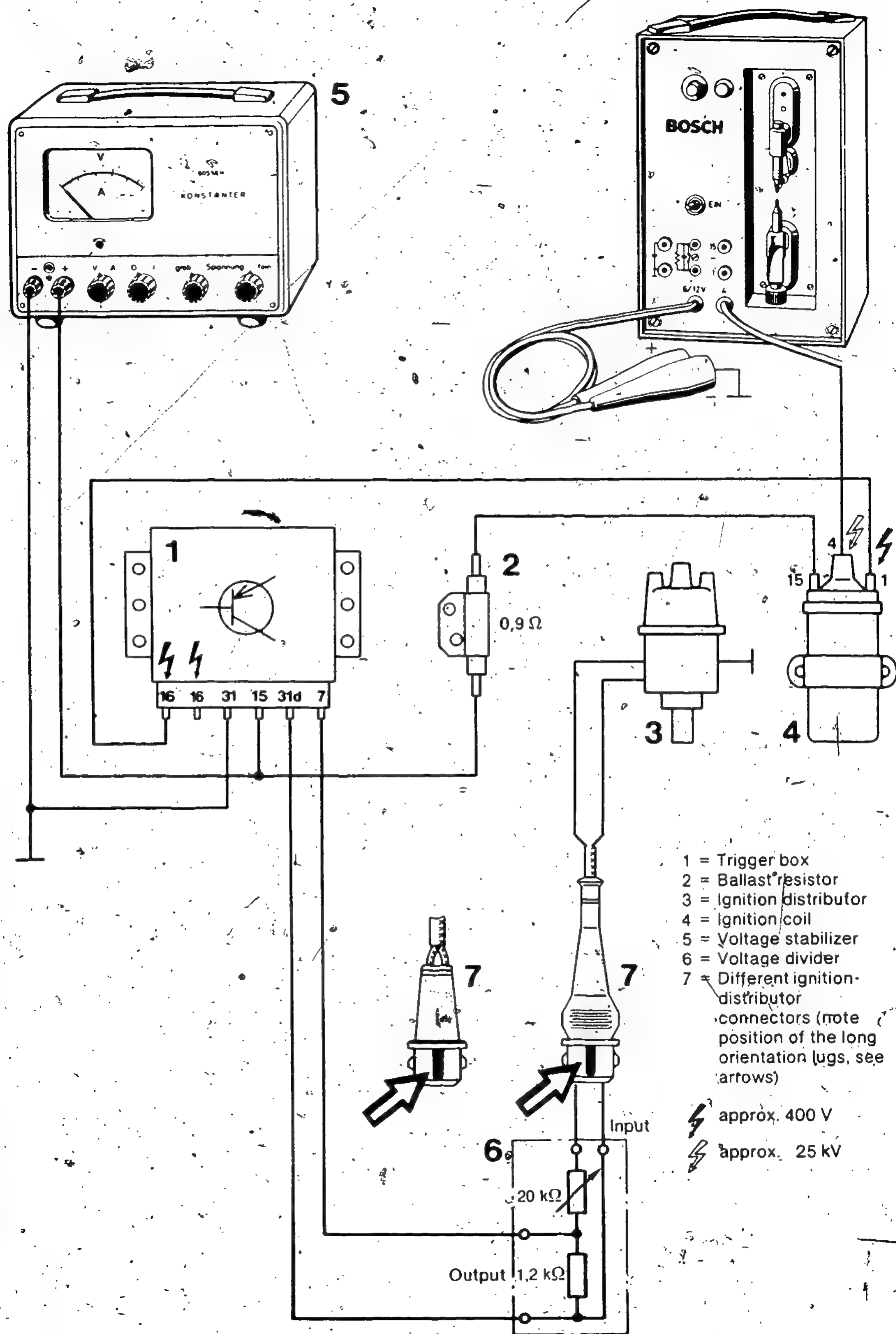
4. Testing

4.1 Test the Input Stage

Disconnect the oscilloscope from the voltage divider output. Connect the output to the trigger box (do not mix up terminals), Fig. 4.
Set the spark gap to 8 mm.
Switch on the voltage stabilizer and set to 14 V. The ignition spark must now be visible at the spark gap. If this is not the case, the trigger box is defective. Switch off the voltage stabilizer.

C16

Figure 4 Connection Diagram



1 = Trigger box
2 = Ballast resistor
3 = Ignition distributor
4 = Ignition coil
5 = Voltage stabilizer
6 = Voltage divider
7 = Different ignition-distributor connectors (note position of the long orientation lugs, see arrows)

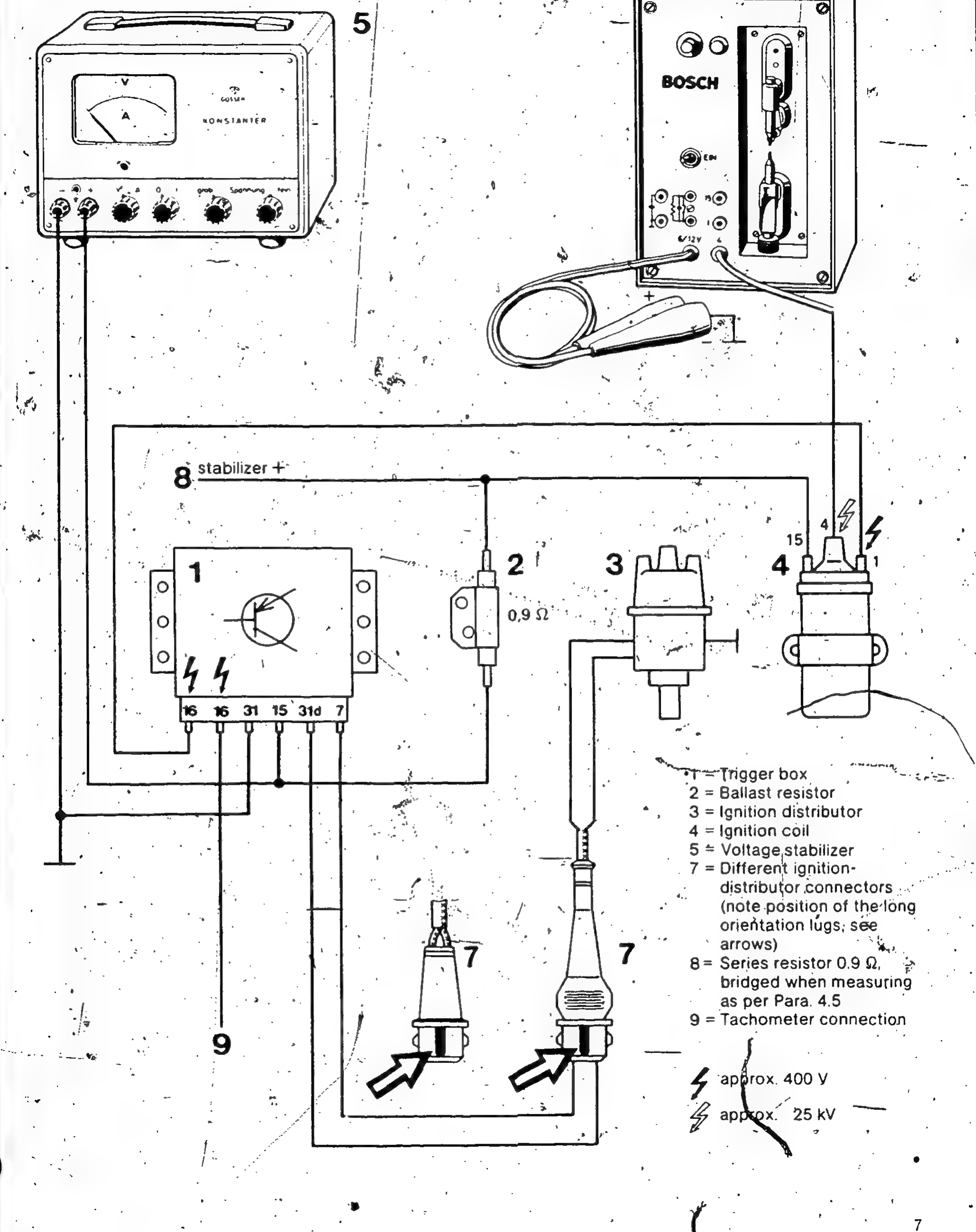
approx. 400 V

approx. 25 kV

4.2 Test the Transistor Output Stage (Zener voltage)

Disconnect the voltage divider and connect the ignition distributor directly to the trigger box. Fig. 5.

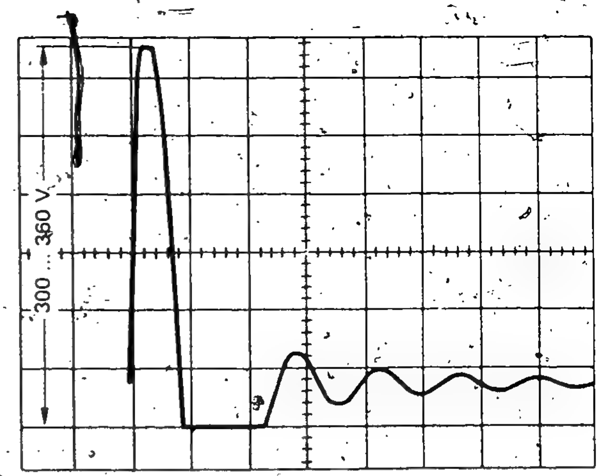
Figure 5 Connection Diagram



1 = Trigger box
2 = Ballast resistor
3 = Ignition distributor
4 = Ignition coil
5 ≙ Voltage stabilizer
7 = Different ignition-distributor connectors (note position of the long orientation lugs, see arrows)
8 = Series resistor 0.9 Ω, bridged when measuring as per Para. 4.5
9 = Tachometer connection

approx. 400 V
approx. 25 kV

Drive the ignition distributor at a speed of 250 min^{-1}. Connect the oscilloscope with probe 1:10 (Important: balance the probe) between ignition coil terminal 1 and ground. Set spark gap to 8 mm. Switch on voltage stabilizer and set to 14 V. An ignition spark must be visible at the spark gap. The oscillogram displayed must correspond to that shown in Fig. 6. The important quantity is the magnitude of the voltage displayed. This should be 300 ... 360 V. If this is not the case, the trigger box is defective. Switch off the voltage stabilizer and disconnect the oscilloscope.



Settings:
y = 5 V/major division
x = 50 µs/major division
300 ... 360 V

Figure 6 Transistor Output Stage Zener Voltage

C19

4.3 Test the Transistor Output Stage ($V_{CE\ sat}$)

Do not drive the ignition distributor.
Connect the voltmeter (measuring range 3 V) between the ignition coil (terminal 1) and ground.
Switch on the voltage stabilizer and set to 14 V.
If the trigger box is not defective, the voltmeter should display 0.5 . . . 2.0 V. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer and disconnect the voltmeter.

4.4 Dwell-angle Measurements

Connect the dwell-angle tester to the ignition coil in accordance with the operating instructions. Switch on the voltage stabilizer and set to 14 V.
Drive the ignition distributor at a speed of $750 \pm 50\ min^{-1}$. The dwell angle should measure 52° . . . 70°.
Drive the ignition distributor at a speed of $3500 \pm 50\ min^{-1}$. The dwell angle should measure 57° . . . 76°.
If these specified values are not attained, the trigger box is defective.
Switch off the voltage stabilizer and disconnect the dwell-angle tester.

4.5 Operating Test at 6 Volts

Switch on the voltage stabilizer and set to 6 V.
Switch off the stabilizer.
Bridge the ballast resistor as shown in connection diagram, Fig. 5, item 8.
Set the spark gap to 8 mm.
Drive the ignition distributor at a speed of approx. $100\ min^{-1}$.
Switch on the voltage stabilizer.
Caution: With the ballast resistor bridged, the applied voltage should not exceed 10 V (trigger box is otherwise destroyed).
If the trigger box is not defective, sparks must be visible at the spark gap. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer. Disconnect the jumper from the 0.9 Ω ballast resistor (from the stabilizer).

4.6 Test Auxiliary Function (Tachometer Terminal 16)

Note: Older trigger boxes do not have the tachometer connection.
Drive the ignition distributor at a speed of approx. $1000\ min^{-1}$.
Set the spark gap to 8 mm.
Connect the tachometer in accordance with the operating instructions and connection diagram, Fig. 5. Switch on the voltage stabilizer and set to 14 V. The tachometer must now show **twice** the ignition distributor speed.
If **no** value is displayed, the trigger box is defective.

After-sales Service Instructions

Testing **22**

VDT-W-227/304 En
Ed. 2

Breakerless Transistorized Ignition System (TCI-i)

with trigger box 0 227 100 007,..019,..026

BOSCH After-sales Service Automotive Equipment

C21

Contents

Caution!

High-energy ignition system. Dangerous primary and secondary voltages.

Please take note of our technical bulletin VDT-I-227/102 En

Automotive Equipment – After-sales Service
Department for Technical Publications KH/VDT
Postfach 50, D-7000 Stuttgart 1

Published by: After-sales Service
Department for Training and Technology (KH/VSK)
Please direct questions and comments concerning the contents to our authorized representative in your country.

Printed in the Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne
par Robert Bosch GmbH.
(12.1978)

C22

1. Testers and Auxiliary Materials Required

Voltage stabilizer ≧ 20 V/15 A	commercially available
Precision oscilloscope, e. g. Hameg 312 (with 1 : 1 and 1 : 10 probes)	commercially available
or	
Philips PM 3200 (with 1 : 1 and 1 : 10 probes)	commercially available
Ignition distributor test bench EFZV 10	0 680 123 001
Dwell-angle tester, e. g. MOT 002.00	0 684 000 200
Voltmeter (3 V scale), e. g. MOT 002.00	0 684 000 200
Spark gap (ignition coil and condenser tester EFAW 106 A)	0 681 100 001
or	
Single spark gap EF 1177/7	1 684 531 000
Complete ignition system consisting of:	
Trigger box (test specimen)	0 227 100 007
or	0 227 100 019
or	0 227 100 026
Ignition distributor (6-cyl. 600 Ω pulse generator) e. g.	0 237 300 001
Ignition coil (KW 12 V)	0 221 122 001
or	0 221 122 003
or	0 221 122 019
Ballast resistor (0.4/0.6 Ω)	0 227 900 101
Connecting parts (for the trigger box)	2 227 000 105
Approx. 1.5 m cable, 1.5 mm² e. g.	6 210 150 150
2 Ignition-coil cable terminals dia. 5 mm	1 901 353 126
2 blade receptacles for ballast resistor	1 901 355 881
1 potentiometer 20 kΩ, 1/3 W (linear)	commercially available
1 resistor 620 Ω, 1/3 W ± 5 %	commercially available

2. Workshop Instructions

- Specified parts of the complete ignition system, including the connecting parts set, should always be used to avoid **destruction** and **incorrect measurement.**
- The measurements must be made at room temperature.
- It is important that the measurements be made at the respective voltage specified.
- The ignition distributor specified for the test must be checked at regular intervals in accordance with the prescribed ignition distributor test instructions.
- The spark gap must be connected and **set to 8 mm** for the entire measuring procedure. The spark gap must be in perfect condition.

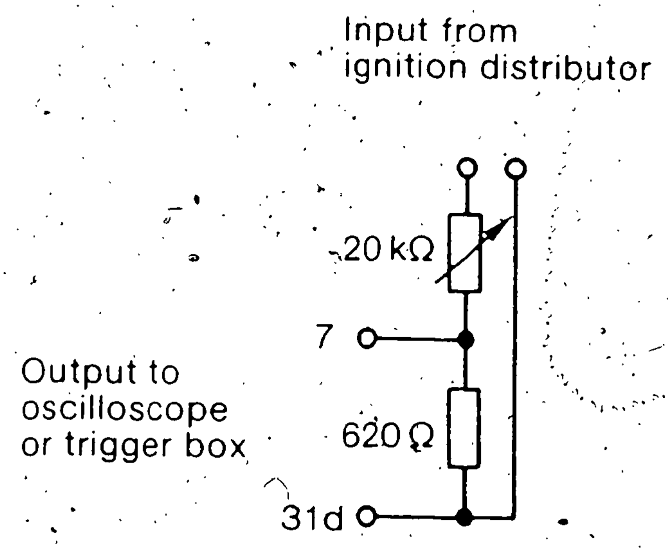


Figure 1 Voltage divider

3. Preparations for Testing

3.1 Making Your Own Voltage Divider

The following parts are needed:

1 potentiometer 20 kΩ, 1/3 W (linear)
1 resistor 620 Ω, 1/3 W ±5%

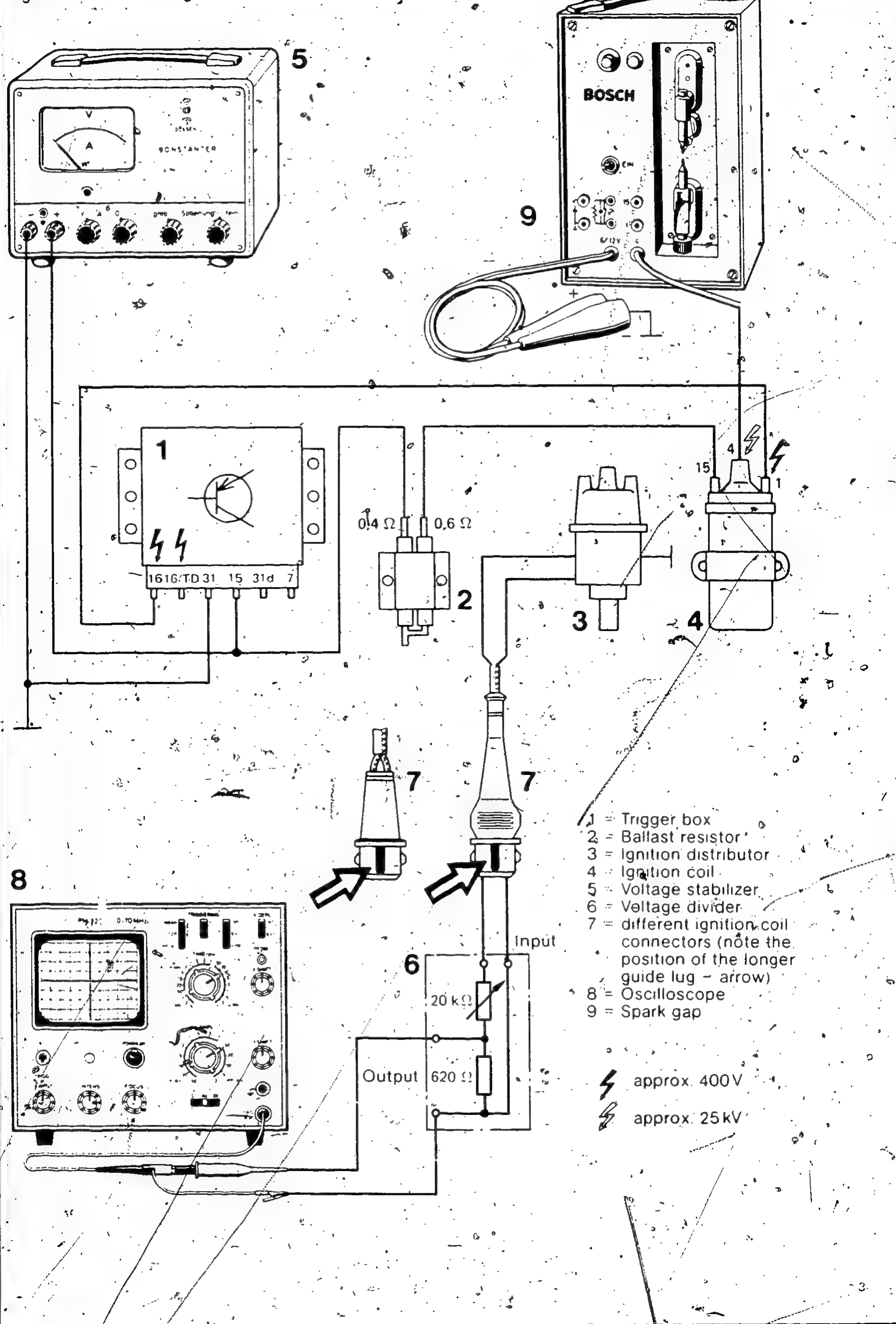
Connect parts electrically, see Fig. 1.

Note: To simplify testing, the voltage divider can be permanently mounted on a board and equipped with connector bushings.

C25

W- 2271 30.4

Fig. 2 Connection diagram



1 = Trigger box
2 = Ballast resistor
3 = Ignition distributor
4 = Ignition coil
5 = Voltage stabilizer
6 = Voltage divider
7 = different ignition coil connectors (note the position of the longer guide lug – arrow)
8 = Oscilloscope
9 = Spark gap

approx. 400 V

approx. 25 kV

C26

3.2 Set Up Complete Ignition System

Switch on the voltage stabilizer and set to 14 V.
Switch off stabilizer.
Set up ignition system, testers, including the voltage divider, (see section 1 for parts) and connect electrically in accordance with the connection diagram, Fig. 2.
Connect the spark gap: **black clip to negative;** do not connect red clip. Connect high-tension cable (terminal 4) to the ignition coil (terminal 4).

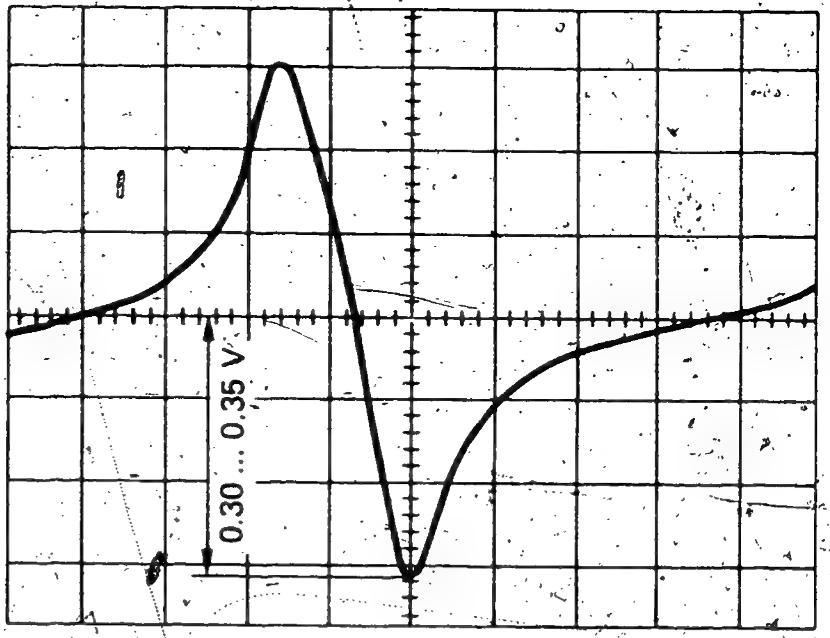


Figure 3 Threshold Voltage

Settings:
y = 0,1 V/major division
x = 5 ms/major division
0.30 ... 0.35 V

3.3 Set the Threshold Voltage

Using the appropriate flange, clamp the ignition distributor into the EFZV 10 ignition distributor test bench and drive at a speed of 250 min^{-1}.
Connect the ignition distributor to the voltage divider input (Fig. 2).
Connect the oscilloscope with the 1:1 probe to the (user-fabricated) voltage divider output, and turn the potentiometer of the voltage divider until the oscilloscope reads 0.30 ... 0.35 V, the **negative** half-wave being measured; see Fig. 3.

Note: The speed of the ignition distributor test bench must be continually checked and corrected as needed during the following measurement.

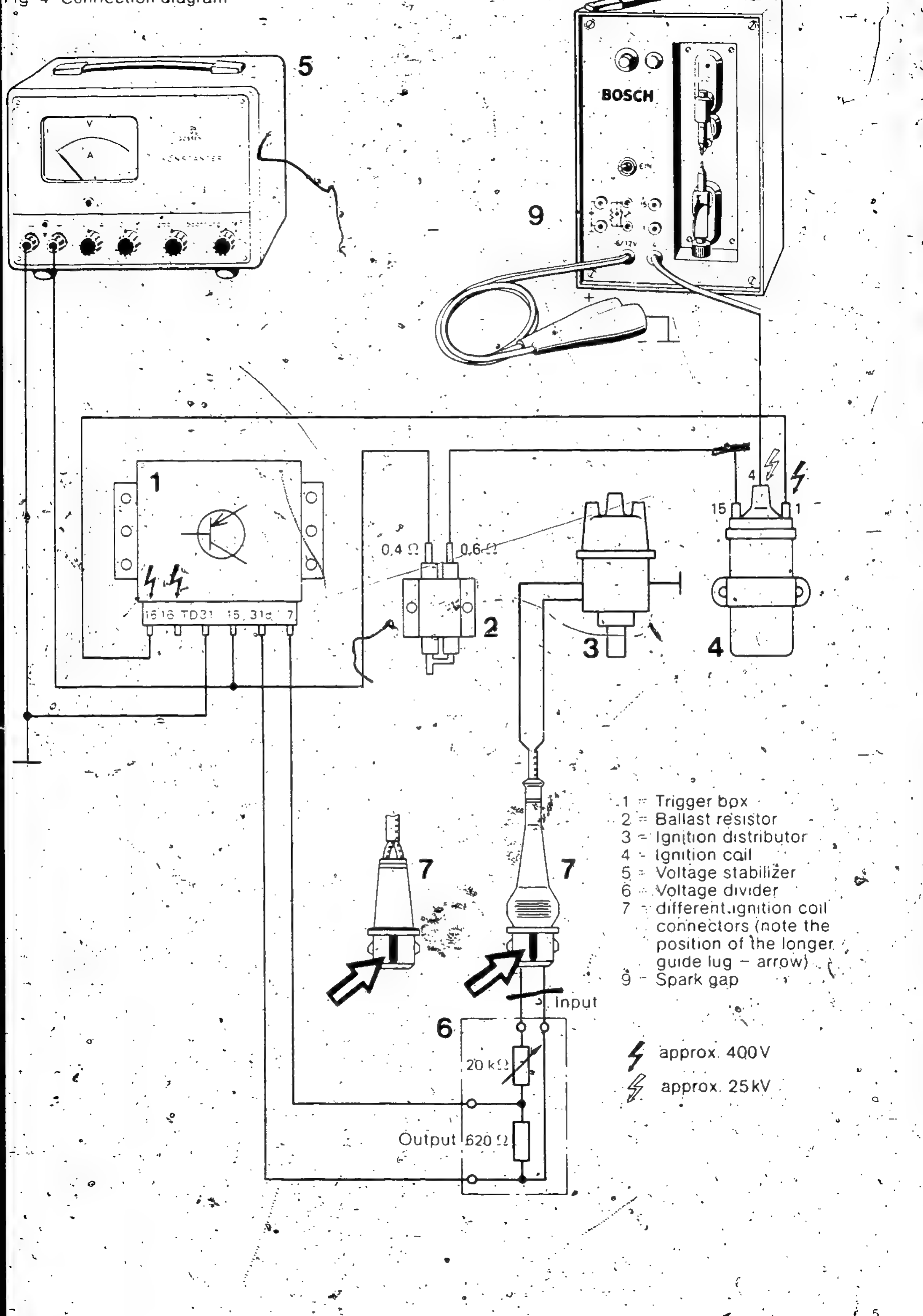
4. Testing

4.1 Test the Input Stage

Disconnect the oscilloscope from the voltage divider output.
Connect the output to the trigger box (do not mix up terminals), Fig. 4.
Set the spark gap to 8 mm.
Switch on the voltage stabilizer and set to 14 V.
The ignition spark must now be visible at the spark gap. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer.

D1

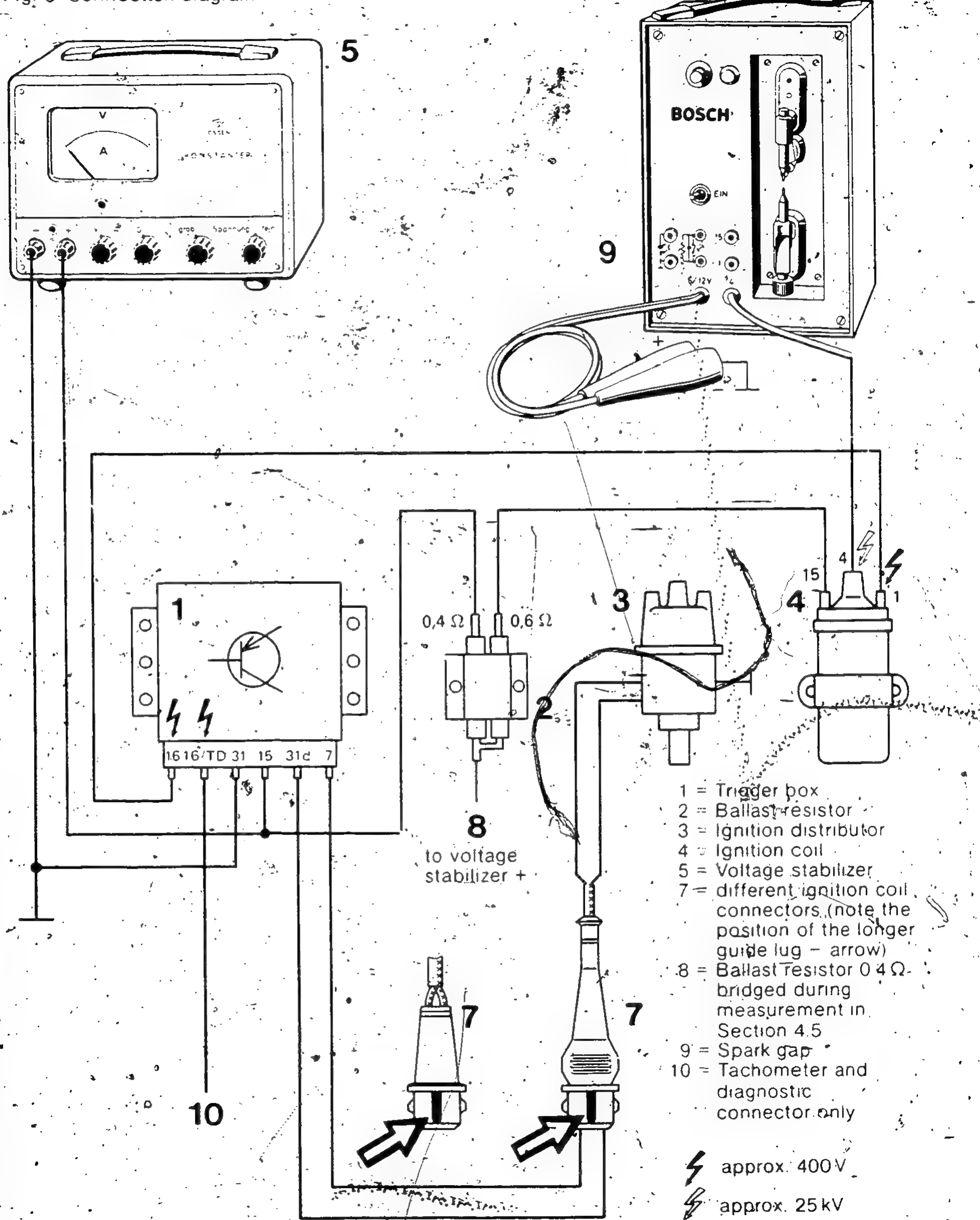
Fig 4 Connection diagram



4.2 Test the transistor output stage (Zener voltage)

Remove the voltage divider and connect the ignition distributor directly to the trigger box (Fig. 5)

Fig. 5 Connection diagram



1 = Trigger box
2 = Ballast resistor
3 = Ignition distributor
4 = Ignition coil
5 = Voltage stabilizer
7 = different ignition coil connectors (note the position of the longer guide lug – arrow)
8 = Ballast resistor 0.4 Ω bridged during measurement in Section 4.5
9 = Spark gap
10 = Tachometer and diagnostic connector only

⚡ approx. 400 V

⚡ approx. 25 kV

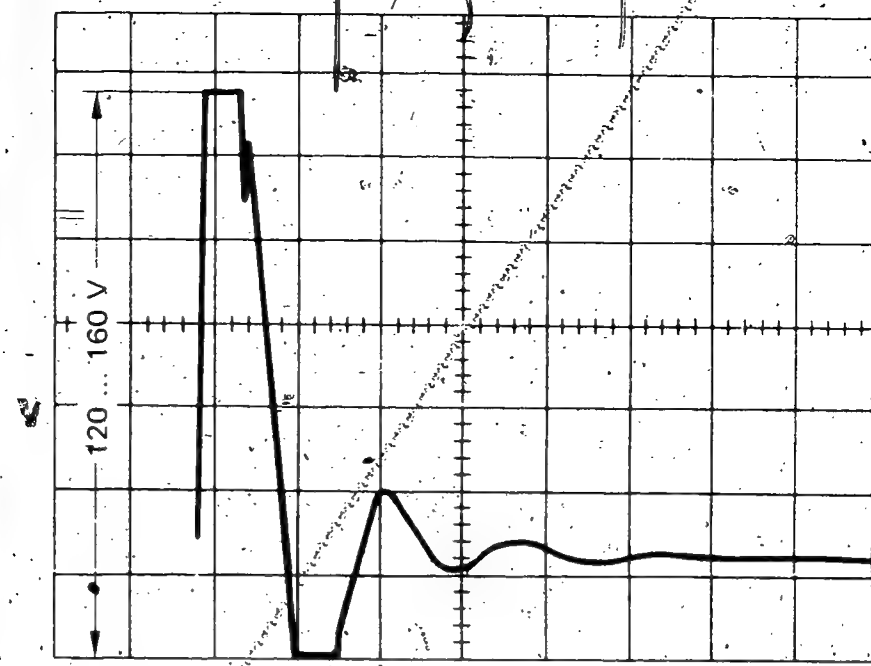


Figure 6 Transistor Output Stage Zener Voltage

Settings:
y = 2 V/major division
x = 50 µs/major division
120 ... 160 V

Drive the ignition distributor at a speed of 250 min^{-1}.
Connect the oscilloscope to the ignition coil (terminal 1) and ground with the 1:10 probe (important: balance probe).
Set spark gap to 8 mm.
Switch on voltage stabilizer and set to 14 V.
An ignition spark must be visible at the spark gap.
The oscillogram displayed must correspond to that shown in Fig. 6.
The important quantity is the magnitude of the voltage displayed.
This should be 120 ... 160 V. If this is not the case, the trigger box is defective. Switch off the voltage stabilizer and disconnect the oscilloscope.

① 4

4.3 Test the Transistor Output Stage ($V_{CE\ sat}$)

Do not drive the ignition distributor.
Connect the voltmeter (measuring range 3 V) between the ignition coil (terminal 1) and ground. Switch on the voltage stabilizer and set to 14 V.
If the trigger box is not defective, the voltmeter should display 0.5 ... 2.0 V. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer and disconnect the voltmeter.

W - 227/304

4.4 Dwell-angle Measurements

Connect the dwell-angle tester to the ignition coil in accordance with the operating instructions. Switch on the voltage stabilizer and set to 14 V.
Drive the ignition distributor at a speed of $750 \pm 50\,min^{-1}$. The dwell angle should measure 33° ... 51°.
Drive the ignition distributor at a speed of $3500 \pm 50\,min^{-1}$.
The dwell angle should measure 43° ... 53°.
If these specified values are not attained, the trigger box is defective.
Switch off the voltage stabilizer and disconnect the dwell-angle tester.

4.5 Operating Test at 6 Volts

Switch on the voltage stabilizer and set to 6 V. Switch off the stabilizer.
Bridge the ballast resistor as shown in connection diagram, Fig. 5, item 8.
Set the spark gap to 8 mm.
Drive the ignition distributor at a speed of $100\,min^{-1}$.
Switch on the voltage stabilizer.
Caution: With the ballast resistor bridged, the applied voltage should not exceed 10 V (trigger box is otherwise destroyed).
If the trigger box is not defective, sparks must be visible at the spark gap. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer. Disconnect the jumper from the 0.4 Ω ballast resistor (from the stabilizer).

4.6 Test Auxiliary Function (Tachometer and Diagnostic Connection, Term 16/TD)

There is no tachometer connection on older trigger boxes.
Drive the ignition distributor at a speed of approx. $1000\,\text{min}^{-1}$.
Set the spark gap to 8 mm.
Connect the tachometer in accordance with the operating instructions and connection diagram, Fig. 5.
Switch on the voltage stabilizer and set to 14 V.
The tachometer must now show **twice** the ignition distributor speed.
If **no** value is displayed, the trigger box is defective.

After-sales Service Instructions

Testing

22

VDT-W-227/314 En
Ed. 2

Breakerless Transistorized Ignition System (TCI-i)

with trigger box 0 227 100 017, ..038

BOSCH After-sales Service Automotive Equipment

D8

This publication has been redesigned with the forthcoming change-over to microfilm in mind.
When a publication has been transferred to microfilm, the screen will be filled completely by a quarter of a printed publication page. For this reason, it is unavoidable that illustrations are repeated in the case of longer texts in which reference is constantly being made to a particular illustration.

Until the change-over to microfilm, we have slightly reduced the size of the print and of the illustrations.

Caution!

High-energy ignition system. Dangerous primary and secondary voltages.

Please take note of our technical bulletin VDT-I-227/102 En

Contents

Automotive Equipment – After-sales Service
Department for Technical Publications KH/VDT
Postfach 50, D-7000 Stuttgart 1

Published by: After-sales Service
Department for Training and Technology (KH/VSK)
Please direct questions and comments concerning the contents to our authorized representative in your country.

Printed in the Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne
par Robert Bosch GmbH.
(3.80)

1. Testers and Auxiliary Materials Required

Voltage stabilizer ≧ 20 V/15 A	commercially available
Precision oscilloscope, e. g. Hameg 312 (with 1 : 1 and 1 : 10 probes)	commercially available
or	
Philips PM 3200 (with 1 : 1 and 1 : 10 probes	commercially available
Ignition distributor test bench EFZV 10	0 680 123 001
Dwell-angle tester, e. g. MOT 002.00	0 684 000 200
Voltmeter (3 V scale), e. g. MOT 002.00	0 684 000 200
Spark gap (ignition coil and condenser tester EFAW 106 A)	0 681 100 001
or	
Single spark gap EF 1177/7	1 684 531 000
Complete ignition system consisting of:	
Trigger box (test specimen)	0 227 100 017
or	0 227 100 038
Ignition distributor (6-cyl. 600 Ω pulse generator) e. g.	0 237 300 001
or	0 237 302 004
or	0 237 302 006
or	0 237 306 006
or	0 237 306 014
Ignition coil (KW 12 V)	0 221 122 008
or	0 221 122 014
or	0 221 122 015
Ballast resistor (0.4/0.6 Ω)	0 227 900 101
Connecting parts (for the trigger box)	2 227 000 101
Approx. 1.5 m cable, 1.5 mm² e. g.	6 210 150 150
2 ignition-coil cable terminals dia. 5 mm	1 901 353 126
2 blade receptacles for ballast resistor	1 901 355 881
1 potentiometer 20 kΩ, 1/3 W (linear)	commercially available
1 resistor 620 Ω, 1/3 W ±5%	commercially available

2. Workshop Instructions

- Specified parts of the complete ignition system, including the connecting parts set, should always be used to avoid **destruction** and **incorrect measurement.**
- The measurements must be made at room temperature.
- It is important that the measurements be made at the respective voltage specified.
- The ignition distributor specified for the test must be checked at regular intervals in accordance with the prescribed ignition distributor test instructions.
- The spark gap must be connected and **set to 8 mm** for the entire measuring procedure. The spark gap must be in perfect condition.

1) 11

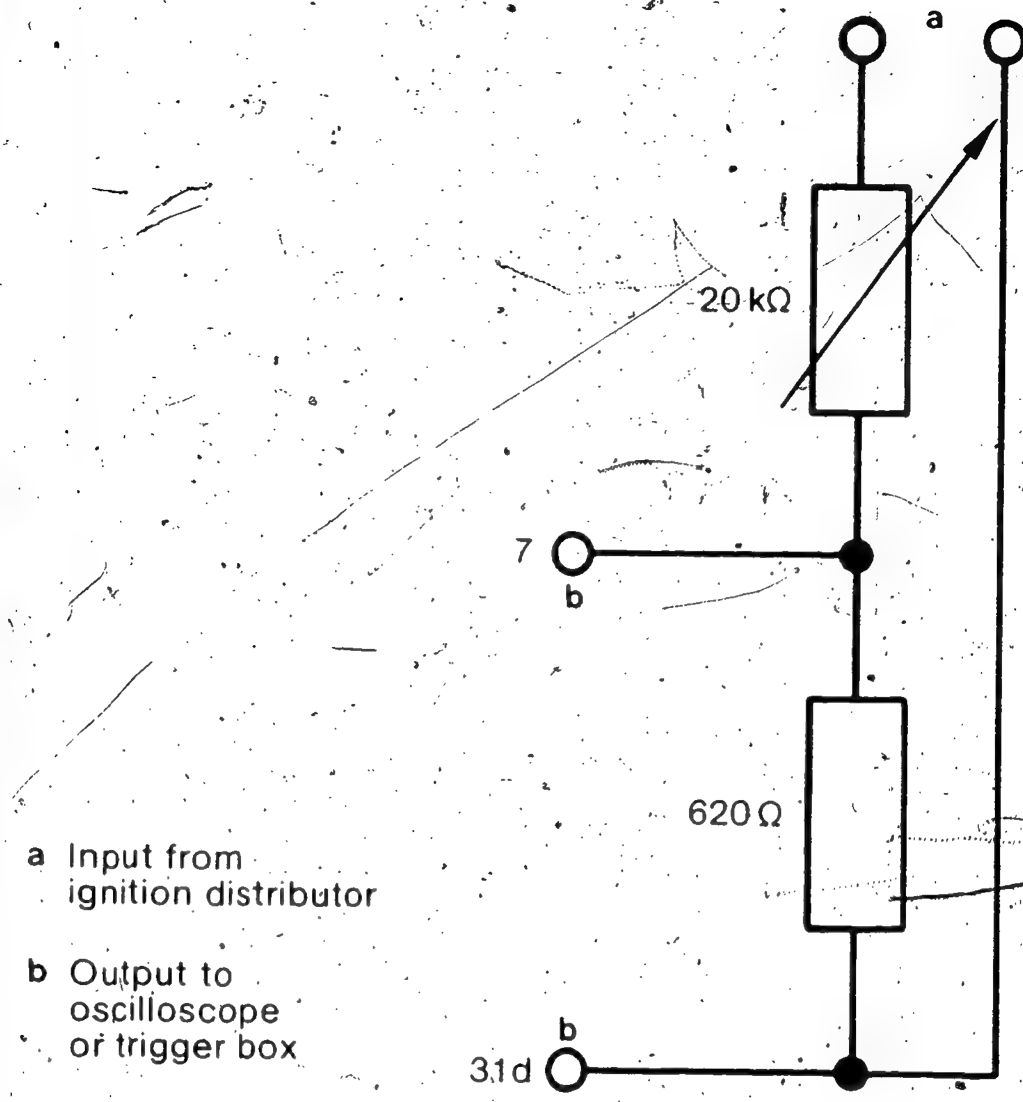


Figure 1 Voltage divider

3. Preparations for Testing

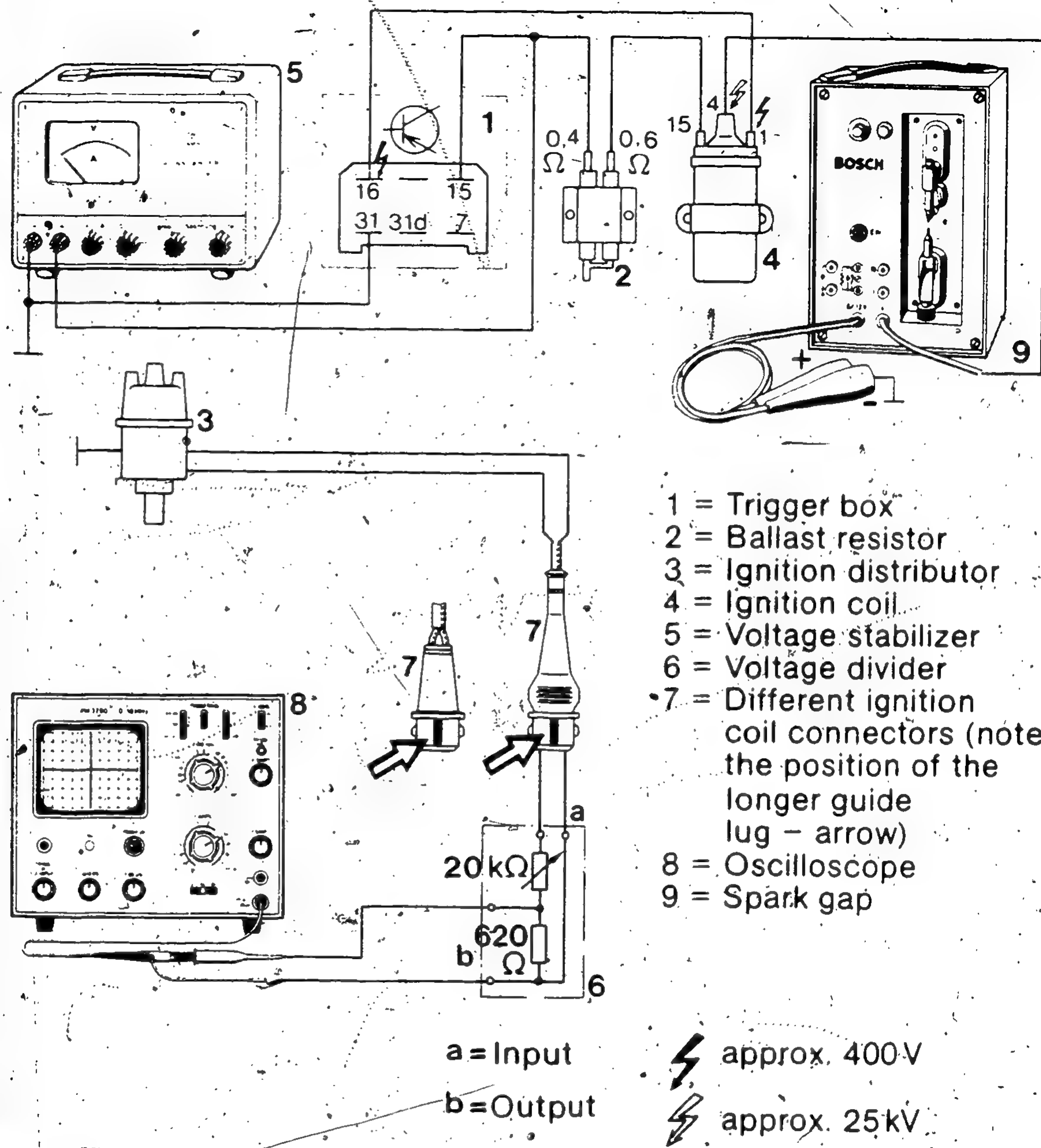
3.1 Making Your Own Voltage Divider

The following parts are needed:

1 potentiometer 20 kΩ, 1/3 W (linear)
1 resistor 620 Ω 1/3 W ±5%

Connect parts electrically, see Fig. 1.

Note: To simplify testing, the voltage divider can be permanently mounted on a board and equipped with connector bushings.



1 = Trigger box
2 = Ballast resistor
3 = Ignition distributor
4 = Ignition coil
5 = Voltage stabilizer
6 = Voltage divider
7 = Different ignition coil connectors (note the position of the longer guide lug – arrow)
8 = Oscilloscope
9 = Spark gap

a = Input
b = Output

approx. 400 V

approx. 25 kV

Fig. 2 Connection diagram

3.2 Set Up Complete Ignition System

Switch on the voltage stabilizer and set to 14 V.
Switch off stabilizer.
Set up ignition system, testers, including the voltage divider, (see section 1 for parts) and connect electrically in accordance with the connection diagram, Fig. 2.
Connect the spark gap: **black clip to negative;** do not connect red clip. Connect high-tension cable (terminal 4) to the ignition coil (terminal 4).

D 13

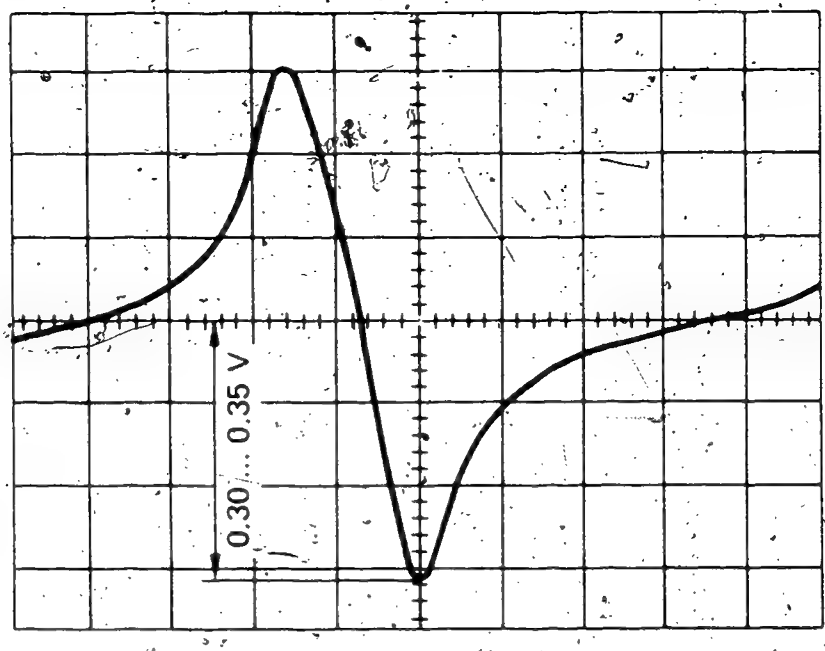


Figure 3 Threshold Voltage

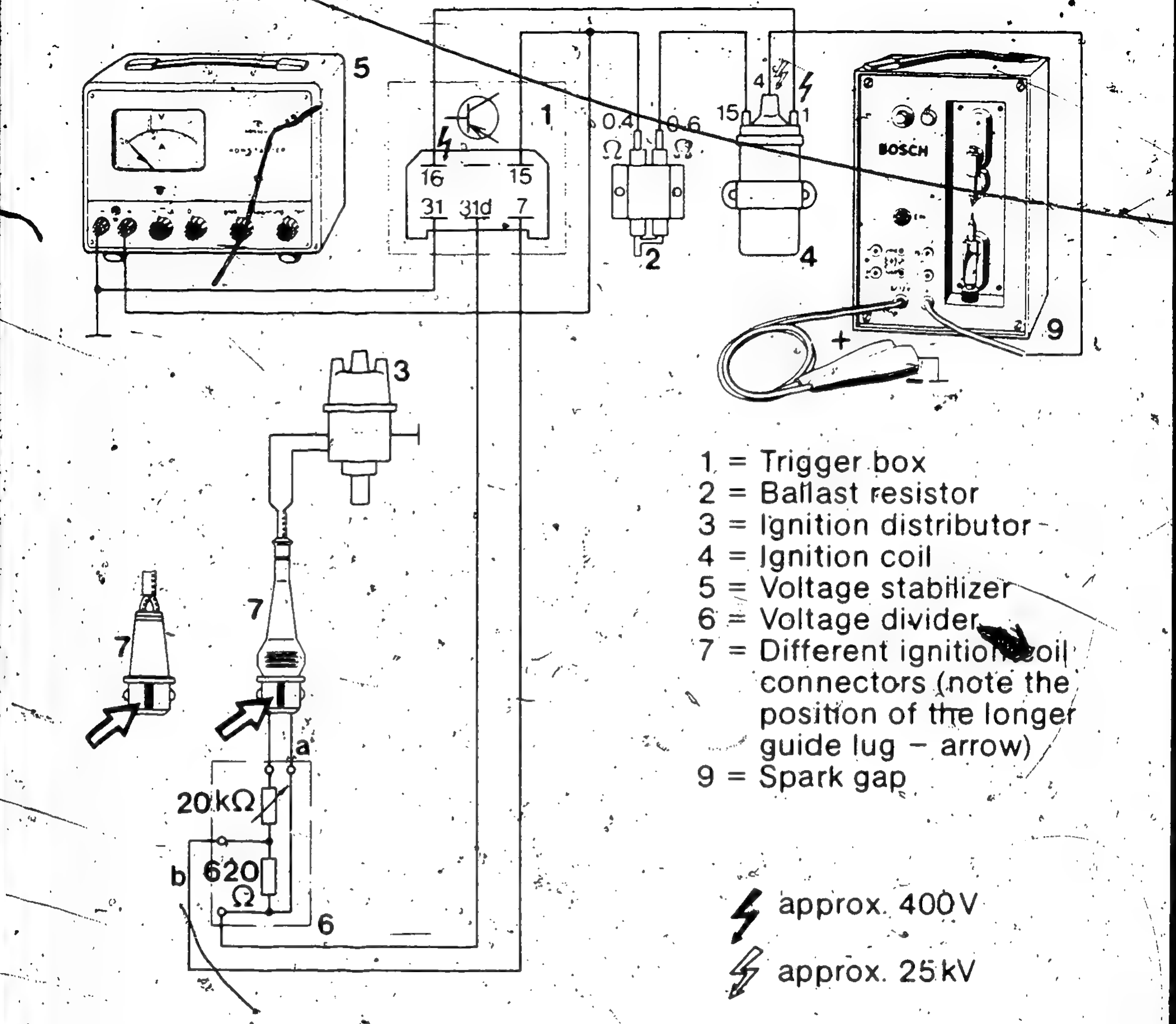
Settings:
y = 0.1 V/major division
x = 5 ms/major division
0.30 ... 0.35 V

3.3 Set the Threshold Voltage

Using the appropriate flange, clamp the ignition distributor onto the EFZV 10 ignition distributor test bench and drive at a speed of 250 min^{-1}.
Connect the ignition distributor to the voltage divider input (Fig. 2).
Connect the oscilloscope with the 1 : 1 probe to the voltage divider output, and turn the potentiometer of the voltage divider until the oscilloscope reads 0.30 ... 0.35 V, the **negative** half-wave being measured; see Fig. 3.

Note: The speed of the ignition distributor test bench must be continually checked and corrected as needed during the following measurement.

W-2271314



1 = Trigger box
2 = Ballast resistor
3 = Ignition distributor
4 = Ignition coil
5 = Voltage stabilizer
6 = Voltage divider
7 = Different ignition coil connectors (note the position of the longer guide lug – arrow)
9 = Spark gap

approx. 400V

approx. 25kV

Fig. 4 Connection diagram

a = Input

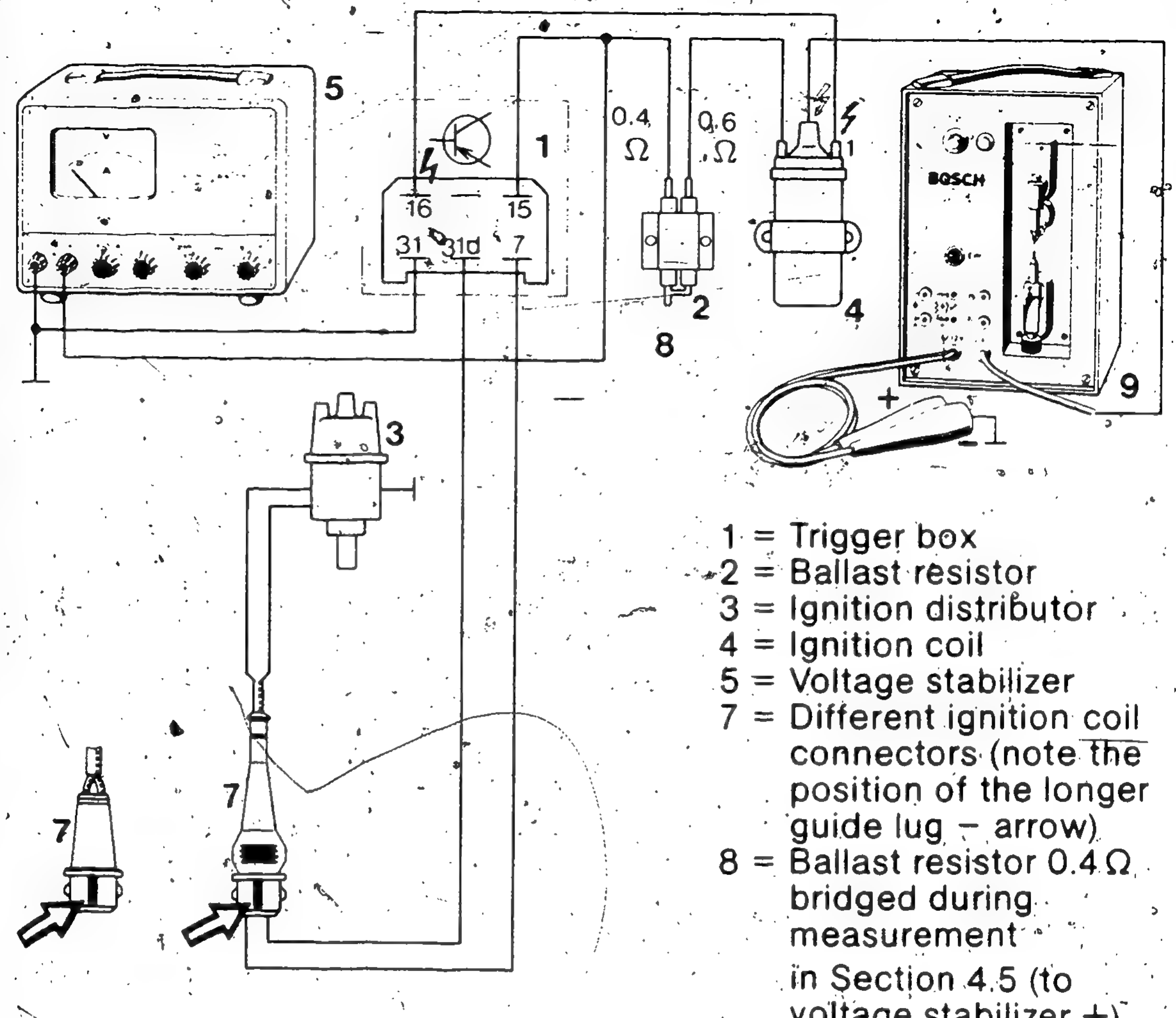
b = Output

4. Testing

4.1 Test the Input Stage

Disconnect the oscilloscope from the voltage divider output.
Connect the output to the trigger box (do not mix up terminals), Fig. 4.
Set the spark gap to 8 mm.
Switch on the voltage stabilizer and set to 14 V.
The ignition spark must now be visible at the spark gap.
If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer.

15



1 = Trigger box
2 = Ballast resistor
3 = Ignition distributor
4 = Ignition coil
5 = Voltage stabilizer
7 = Different ignition coil connectors (note the position of the longer guide lug – arrow)
8 = Ballast resistor 0.4 Ω bridged during measurement in Section 4.5 (to voltage stabilizer +)
9 = Spark gap

Fig. 5 Connection diagram

ϟ approx. 400 V

ϟ approx. 25 kV

Fig. 4.2 Test the transistor output stage (Zener voltage)

Dismantle the voltage divider and connect the ignition distributor direct to the trigger box, Fig. 5.
Drive the ignition distributor at a speed of 250 min^{-1}.
Connect the oscilloscope with the 1:10 probe (important: balance probe) to the ignition coil (terminal 1) and ground.
Set spark gap to 8 mm.
Switch on voltage stabilizer and set to 14 V.
An ignition spark must be visible at the spark gap.

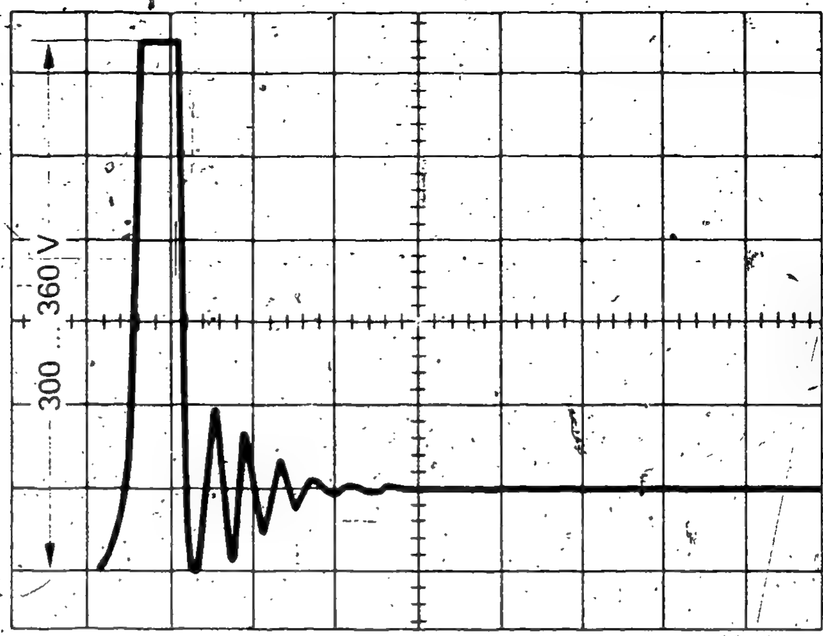


Figure 6 Transistor Output Stage Zener Voltage

Settings:
y = 5 V/major division
x = 50 µs/major division
300 ... 360 V

The oscillogram displayed must correspond to that shown in Fig. 6. The important quantity is the magnitude of the voltage displayed. This should be 300 ... 360 V. If this is not the case, the trigger box is defective. Switch off the voltage stabilizer and disconnect the oscilloscope.

4.3 Test the Transistor Output Stage ($V_{CE\ sat}$)

Do not drive the ignition distributor.
Connect the voltmeter (measuring range 3 V) between the ignition coil (terminal 1) and ground. Switch on the voltage stabilizer and set to 14 V.
If the trigger box is not defective, the voltmeter should display 0.5 ... 2.0 V. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer and disconnect the voltmeter.

4.4 Dwell-angle Measurements

Connect the dwell-angle tester to the ignition coil in accordance with the operating instructions. Switch on the voltage stabilizer and set to 14 V.
Drive the ignition distributor at a speed of $750 \pm 50\,\mathrm{min}^{-1}$.
The dwell angle should measure 33° ... 51°.
Drive the ignition distributor at a speed of $3500 \pm 50\,\mathrm{min}^{-1}$.
The dwell angle should measure 43° ... 53°.
If these specified values are not attained, the trigger box is defective.
Switch off the voltage stabilizer and disconnect the dwell-angle tester.

4.5 Operating Test at 6 Volts

Switch on the voltage stabilizer and set to 6 V. Switch off the stabilizer.
Bridge the ballast resistor as shown in connection diagram, Fig. 5, item 8.
Set the spark gap to 8 mm.
Drive the ignition distributor at a speed of $100\,\mathrm{min}^{-1}$.
Switch on the voltage stabilizer.
Caution: With the ballast resistor bridged, the applied voltage should not exceed 10 V (trigger box is otherwise destroyed).
If the trigger box is not defective, sparks must be visible at the spark gap. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer. Disconnect the jumper from the 0.4 Ω ballast resistor (from the stabilizer).

After-sales Service Instructions

Testing

22

VDT-W-227/301 B

Breakerless Transistorized Ignition System (TCI-i)

with trigger box 0 227 100 001

BOSCH After-sales Service Automotive Equipment

D19

Table of Contents

1. Danger of Accident on Semiconductor Ignition Systems

Please be sure to pass this bulletin on to your employees for their attention.

The increased demands made on their ignition systems by modern engines, and the wish for freedom from maintenance, led some time ago to manufacturers starting to equip their vehicles with semiconductor ignition systems as original equipment. In most cases the performance of nearly all makes of such systems is higher than that of conventional systems, and further improvements are to be expected.
This means that semiconductor ignition systems have reached the point where contact with "live" parts or contacts (whether on the primary side or the secondary side) can prove fatal.

In this respect, we should like to point out to you that when working on or testing the ignition system, VDE regulations, in particular VDE-0104/7.67, should be complied with.
Note: The VDE regulation was sent to the Bosch organization with the technical information sheet VDT-I-227/102 B dated February 3, 1976.

As a matter of principle, when working on such ignition systems the ignition is to be switched off and the battery disconnected. Included in such work are the following operations:

- Connection of engine testing equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).
- Replacement of ignition system parts (spark plugs, ignition coil, ignition distributor, H. T. ignition cables etc.).

If it is necessary to switch on the ignition in order to test the system or make adjustments on the engine (to the carburetor for instance), then lethal voltages are present throughout the **entire system.**

This means that the danger of accident exists not only at individual components in the system (e. g. ignition distributor, ignition coil, trigger box, ignition harness), but also at the wiring harness (e. g. connection for the tachometer, diagnostic connector), on terminals, and on test equipment.

By way of example, the danger points in the semiconductor ignition system are marked with red high-voltage arrows in the following connection diagrams.

Cable color code
br = brown
ge = yellow
gn = green
rt = red
sw = black

D20

D 20

2. Testers and Auxiliary Materials Required

Voltage stabilizer 20 V/15 A	commercially available
Precision oscilloscope, e. g. Hameg 312 (with 1:1 and 1:10 voltage dividers)	commercially available
or	
Philips PM 3200 (with 1:1 and 1:10 voltage dividers)	commercially available
Ignition distributor test bench EFZV 10	0 680 123 001
Dwell-angle tester, e. g. EFAW 226	0 681 102 800
Voltmeter (3 V scale), e. g. EFAW 226	0 681 102 800
Spark gap (ignition coil and condenser tester EFAW 106 A)	0 681 100 001
or	
Single spark gap EF 1177/7	1 684 531 000
Complete ignition system consisting of:	
Trigger box (test specimen)	0 227 100 001
Ignition distributor (6 cyl. 600 Ω pulse generator)	0 237 300 001
Ignition coil (KW 12 V)	0 221 122 001
Ballast resistor (0.4 Ω)	0 227 901 012
Ballast resistor (0.6 Ω)	0 227 901 013
Connecting parts (for the trigger box) consisting of:	
5 Eisemann pin terminals	8 781 355 000
or	
4-pole connector Mercedes Benz Part No.	1 165 408 309
and 2-pole connector Mercedes Benz Part No.	0 001 596 118
or	
Bosch Part No.	1 234 431 181
1 potentiometer 20 kΩ, 1/3 W (linear)	commercially available
1 resistor 620 Ω, 1/3 W ± 5%	commercially available
approx. 1.5 m cable, 1.5 mm², e. g.	6 210 150 150
2 ignition-cable terminals for the ignition coil	1 901 353 126
4 ignition-cable terminals for ballast resistors	1 901 353 125

3. Workshop Instructions

- Specified parts of the complete ignition system, including the connecting parts set, should always be used to avoid **destruction** and **incorrect measurement.**
- The measurements must be made at room temperature.
- It is important that the measurements be made at the respective voltage specified.
- The ignition distributor specified for the test must be checked at regular intervals in accordance with the prescribed ignition distributor test instructions.
- The spark gap must be connected and **set to 8 mm** for the entire measuring procedure. The spark gap must be in perfect condition.

4. Preparations for Testing

4.1 Making Your Own Voltage Divider

The following parts are needed:

1 potentiometer 20 kΩ, 1/3 W (linear)
1 resistor 620 Ω, 1/3 W ± 5%

Connect parts electrically, see Fig. 1.

Note: To simplify testing, the voltage divider can be permanently mounted on a board and equipped with connector bushings.

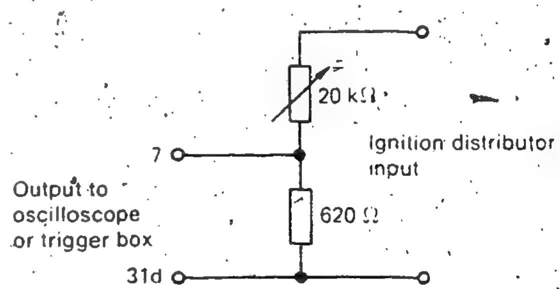
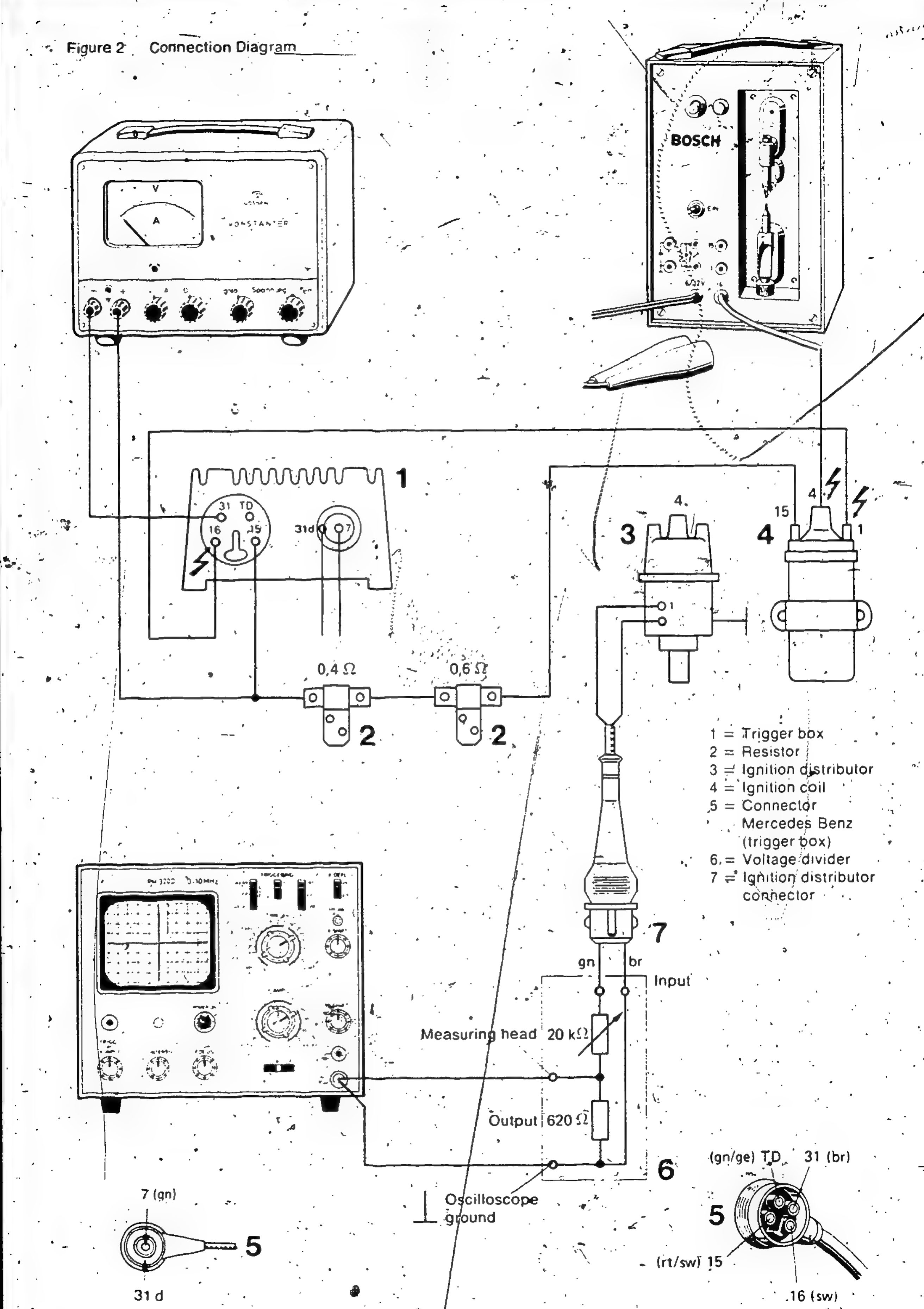


Figure 1 Voltage divider

D21

Seite 4

Figure 2 Connection Diagram



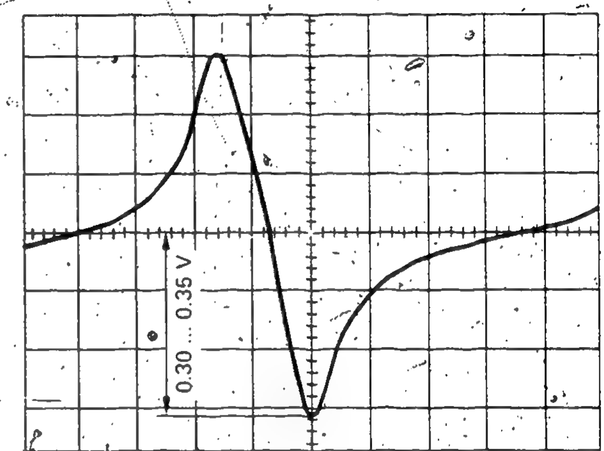
1 = Trigger box
2 = Resistor
3 = Ignition distributor
4 = Ignition coil
5 = Connector Mercedes Benz (trigger box)
6 = Voltage divider
7 = Ignition distributor connector

4.2 Set Up Complete Ignition System

Switch on the voltage stabilizer and set to 14 V.
Switch off stabilizer.
Set up ignition system, testers, including the voltage divider, (see section 2 for parts) and connect electrically in accordance with the connection diagram, Fig. 2.
Note: The colors of the conductors in the ignition distributor connector can be seen after pushing back the rubber sleeve.
Connect the spark gap: black clip to negative; do not connect red clip. Connect high-tension cable (terminal 4) to the ignition coil (terminal 4).

4.3 Set the Threshold Voltage

Using the appropriate flange, clamp the ignition distributor into the EFZV 10 ignition distributor test bench and drive at a speed of 250 min^{-1}.
Connect the ignition distributor to the voltage divider input (Fig. 2). Connect the oscilloscope with the voltage divider on 1:1 to the (user-fabricated) voltage divider output, and turn the potentiometer of the voltage divider until the oscilloscope reads 0.30 ... 0.35 V, the negative half-wave being measured; see Fig. 3.
Note: The speed of the ignition distributor test bench must be continually checked and corrected as needed during the following measurement.



Settings:
y = 0.1 V/major division
x = 5 ms/major division
0.30 ... 0.35 V

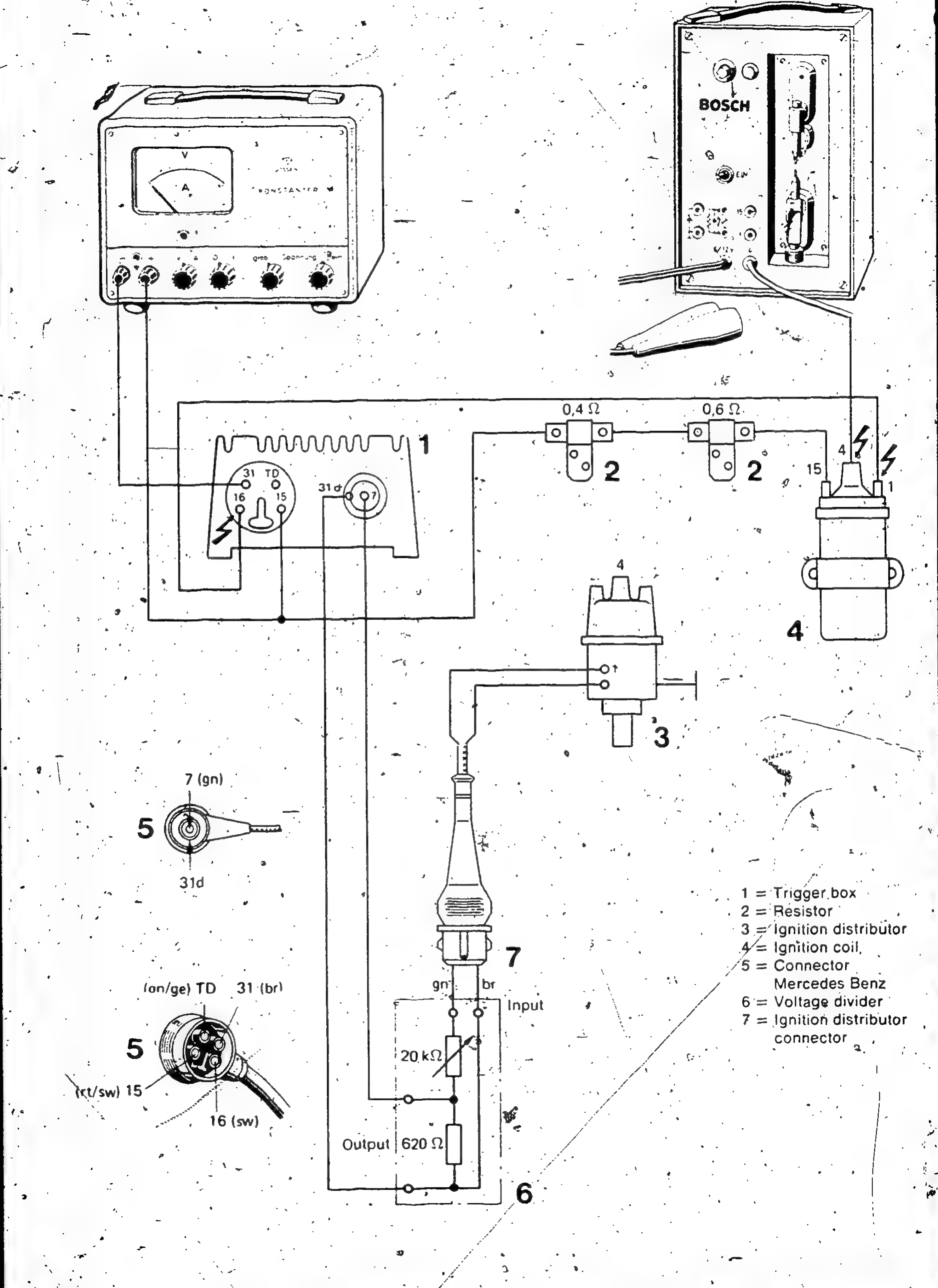
Figure 3 Threshold Voltage

5. Testing

5.1 Test the Input Stage

Disconnect the oscilloscope from the voltage divider output. Connect the output to the trigger box (do not mix up terminals), Fig. 4.
Set the spark gap to 8 mm.
Switch on the voltage stabilizer and set to 14 V.
The ignition spark must now be visible at the spark gap. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer.

Figure 4 Connection Diagram

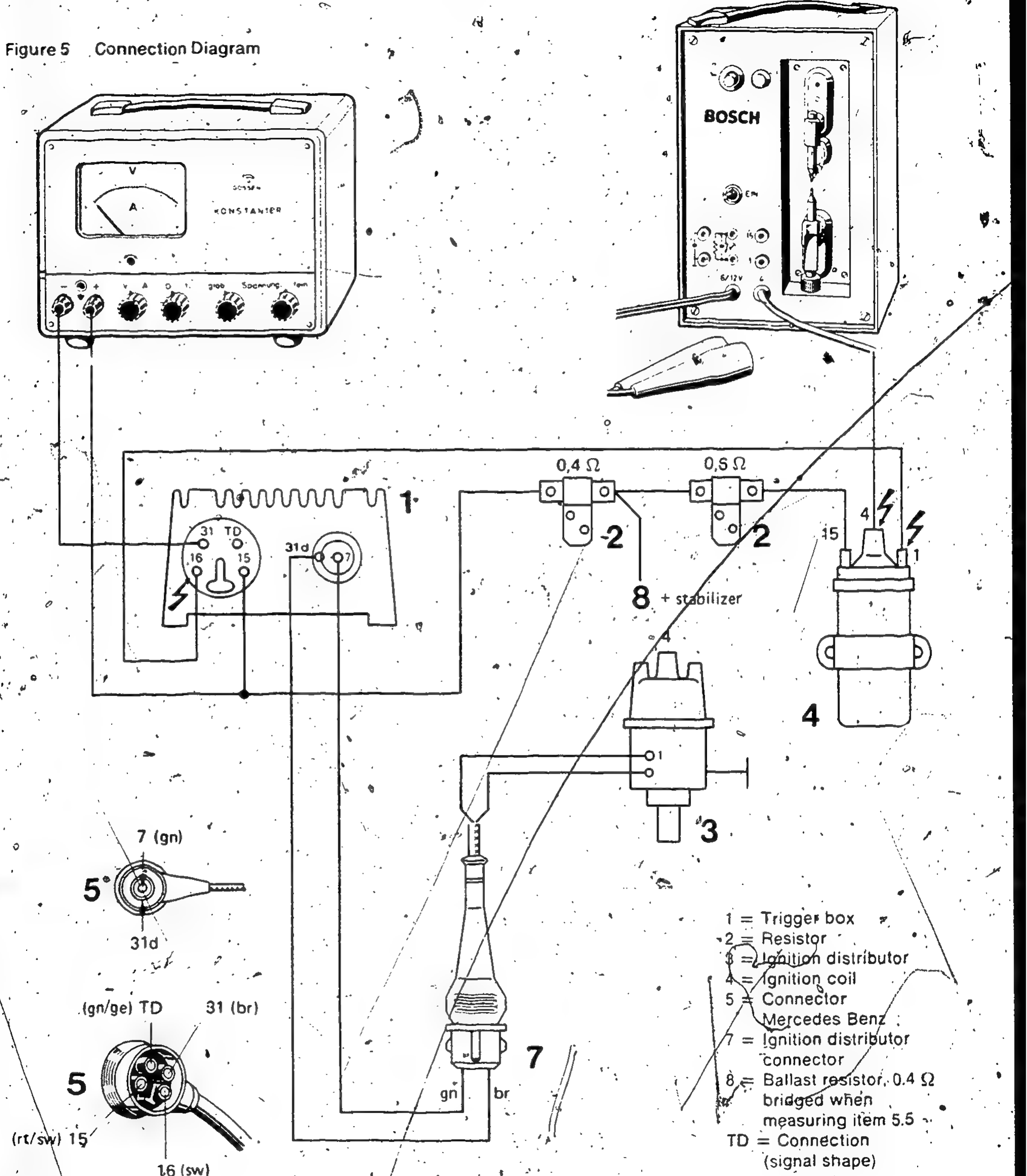


W-2271 §01
Seite 7

5.2 Test the Transistor Output Stage (Zener voltage)

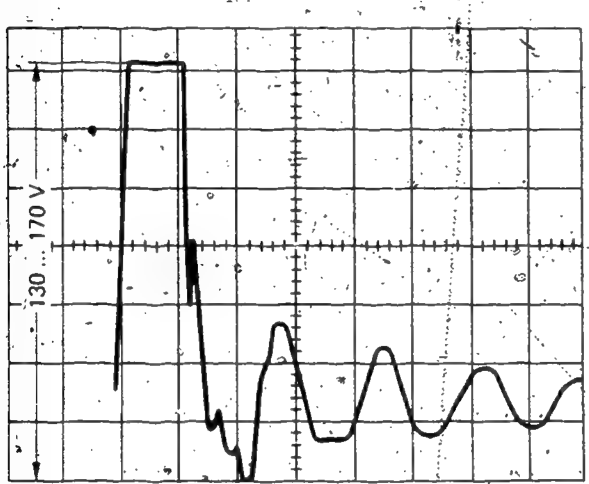
Disconnect the voltage divider and connect the ignition distributor directly to the trigger box, Fig. 5.

Figure 5 Connection Diagram



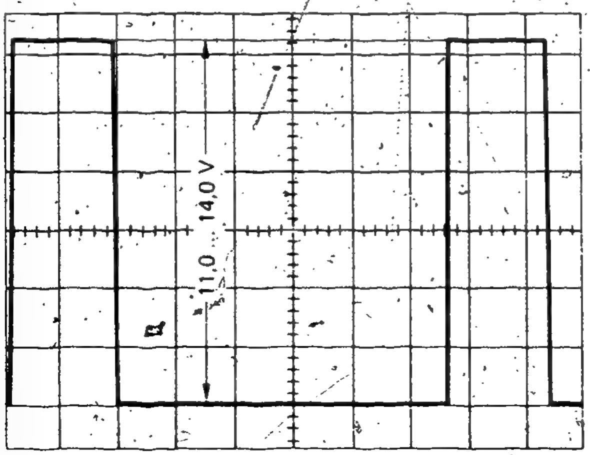
1 = Trigger box
2 = Resistor
3 = Ignition distributor
4 = Ignition coil
5 = Connector Mercedes Benz
7 = Ignition distributor connector
8 = Ballast resistor, 0.4 Ω bridged when measuring item 5.5
TD = Connection (signal shape)

Drive the ignition distributor at a speed of 250 min^{-1}.
Connect the oscilloscope to the ignition coil (terminal 1) and ground with the voltage divider on 1:10 (important: balance voltage divider).
Set spark gap to 8 mm.
Switch on voltage stabilizer and set to 14 V.
An ignition spark must be visible at the spark gap.
The oscillogram displayed must correspond to that shown in Fig. 6. The important quantity is the magnitude of the voltage displayed. This should be 130 . . . 170 V. If this is not the case, the trigger box is defective. Switch off the voltage stabilizer and disconnect the oscilloscope.



Settings:
y = 2 V/major division
x = 20 µs/major division

Figure 6 Transistor Output Stage Zener Voltage



Settings:
y = 2 V/major division
x = 5 ms/major division

Figure 7 TD Signal Shape

5.3 Test the Transistor Output Stage ($V_{CE\,(o)}$)

Do not drive the ignition distributor.
Connect the voltmeter (measuring range 3 V) between the ignition coil (terminal 1) and ground. Switch on the voltage stabilizer and set to 14 V.
If the trigger box is not defective, the voltmeter should display 0.5 . . . 2.0 V. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer and disconnect the voltmeter.

5.4 Dwell-angle Measurements

Connect the dwell-angle tester to the ignition coil in accordance with the operating instructions. Switch on the voltage stabilizer and set to 14 V.
Drive the ignition distributor at a speed of 750 ± 50 min^{-1}. The dwell angle should measure 33 . . . 51°.
Drive the ignition distributor at a speed of 3500 ± 50 min^{-1}. The dwell angle should measure 43° . . . 53°.
If these specified values are not attained, the trigger box is defective.
Switch off the voltage stabilizier and disconnect the dwell-angle tester.

5.5 Operating Test at 6 Volts

Switch on the voltage stabilizer and set to 6 V, Switch off the stabilizer.
Bridge the ballast resistor as shown in connection diagram, Fig. 5, item 8.
Set the spark gap to 8 mm.
Drive the ignition distributor at a speed of 100 min^{-1}.
Switch on the voltage stabilizer.
Caution: With the ballast resistor bridged, the applied voltage should not exceed 10 V (trigger box is otherwise destroyed).
If the trigger box is not defective, sparks must be visible at the spark gap. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer. Disconnect the jumper from the 0.4 Ω ballast resistor (from the stabilizer).

5.6 Test Auxiliary Function (TD Signal Shape)

Drive the ignition distributor at a speed of approx. 250 min^{-1}.
Set the spark gap to 8 mm.
With the voltage divider on 1:1, connect the oscilloscope to terminal TD of the trigger box, referenced to ground. Switch on the voltage stabilizer and set to 14 V. The oscillogram displayed should correspond to that shown in Fig. 7.
It is important that a rectangular-wave voltage with an amplitude of 11.0 . . . 14.0 V be displayed.
If this is not the case, the trigger box is defective.

After-sales Service Instructions

Testing **22**

VDT-W-227/303 B

Breakerless Transistorized Ignition System (TCI-i)

with trigger box 0 227 100 006

BOSCH After-sales Service
Automotive
Equipment

D27

Table of Contents

Automotive Equipment – After-sales Service
Department for Technical Publications KH/VDT
Postfach 50, D-7000 Stuttgart 1

Please direct questions and comments concerning the contents to our authorized representative in your country.

Printed in the Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.
(10.76)

1. Danger of Accident on Semiconductor Ignition Systems

Please be sure to pass this bulletin on to your employees for their attention.

The increased demands made on their ignition systems by modern engines, and the wish for freedom from maintenance, led some time ago to manufacturers starting to equip their vehicles with semiconductor ignition systems as original equipment. In most cases the performance of nearly all makes of such systems is higher than that of conventional systems, and further improvements are to be expected.

This means that semiconductor ignition systems have reached the point where contact with "live" parts or contacts (whether on the primary side or the secondary side) can prove fatal.

In this respect, we should like to point out to you that when working on or testing the ignition system, VDE regulations, in particular VDE-0104/7.67, should be complied with.

Note: The VDE regulation was sent to the Bosch organization with the technical information sheet VDT-I-227/102 B dated February 3, 1976.

As a matter of principle, when working on such ignition systems the ignition is to be switched off and the battery disconnected. Included in such work are the following operations:

- Connection of engine testing equipment (timing light, dwell-tach tester, ignition oscilloscope etc.)
- Replacement of ignition system parts (spark plugs, ignition coil, ignition distributor, H. T. ignition cables etc.)

If it is necessary to switch on the ignition in order to test the system or make adjustments on the engine (to the carburetor for instance), then lethal voltages are present throughout the **entire system.**

This means that the danger of accident exists not only at individual components in the system (e. g. ignition distributor, ignition coil, trigger box, ignition harness), but also at the wiring harness (e. g. connection for the tachometer, diagnostic connector), on terminals, and on test equipment.

By way of example, the danger points in the semiconductor ignition system are marked with red high-voltage arrows in the following connection diagrams.

Cable color code

br = brown
ge = yellow
gn = green
rt = red
sw = black

W-227/303
Seite 3

2. Testers and Auxiliary Materials Required

Voltage stabilizer ≥ 20 V/15 A	commercially available
Precision oscilloscope, e. g. Hameg 312 (with 1:1 and 1:10 voltage dividers)	commercially available
or	
Philips PM 3200 (with 1:1 and 1:10 voltage dividers)	commercially available
Ignition distributor test bench EFZV 10	0 680 123 001
Dwell-angle tester, e. g. EFAW 226	0 681 102 800
Voltmeter (3 V scale), e. g. EFAW 226	0 681 102 800
Spark gap (ignition coil and condenser tester EFAW 106 A)	0 681 100 001
or	
Single spark gap EF 1177/7	1 684 531 000
Complete ignition system consisting of:	
Trigger box (test specimen)	0 227 100 006
Ignition distributor (6 cyl. 600 Ω pulse generator)	0 237 300 001
Ignition coil (KW 12 V)	0 221 122 002
Ballast resistor (0.9 Ω)	0 227 900 002
Connecting parts set (for the trigger box) consisting of: 1 protective cap, 1 plug connector, 3 contact springs, 2 contact springs	2 227 000 105
1 potentiometer 20 kΩ, 1/3 W (linear)	commercially available
1 resistor 620 Ω, 1/3 W ± 5%	commercially available
approx. 1.5 m cable, 1.5 mm², e. g.	6 210 150 150
2 ignition-cable terminals for the ignition coil	1 901 353 126
2 blade receptacles for ballast resistor	1 901 355 881

3. Workshop Instructions

- Specified parts of the complete ignition system, including the connecting parts set, should always be used to avoid **destruction and incorrect measurement**.
- The measurements must be made at room temperature.
- It is important that the measurements be made at the respective voltage specified.
- The ignition distributor specified for the test must be checked at regular intervals in accordance with the prescribed ignition distributor test instructions.
- The spark gap must be connected and **set to 8 mm** for the entire measuring procedure. The spark gap must be in perfect condition.

4. Preparations for Testing

4.1 Making Your Own Voltage Divider

The following parts are needed:

1 potentiometer 20 kΩ, 1/3 W (linear)
1 resistor 620 Ω, 1/3 W ± 5%

Connect parts electrically, see Fig. 1.

Note: To simplify testing, the voltage divider can be permanently mounted on a board and equipped with connector bushings.

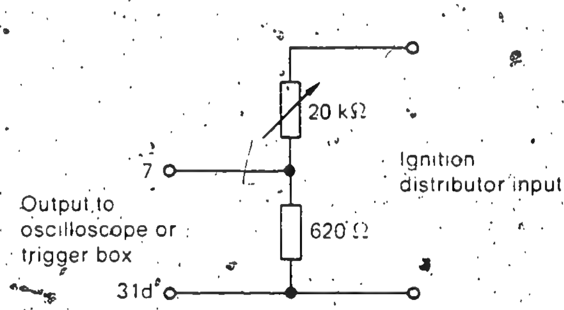
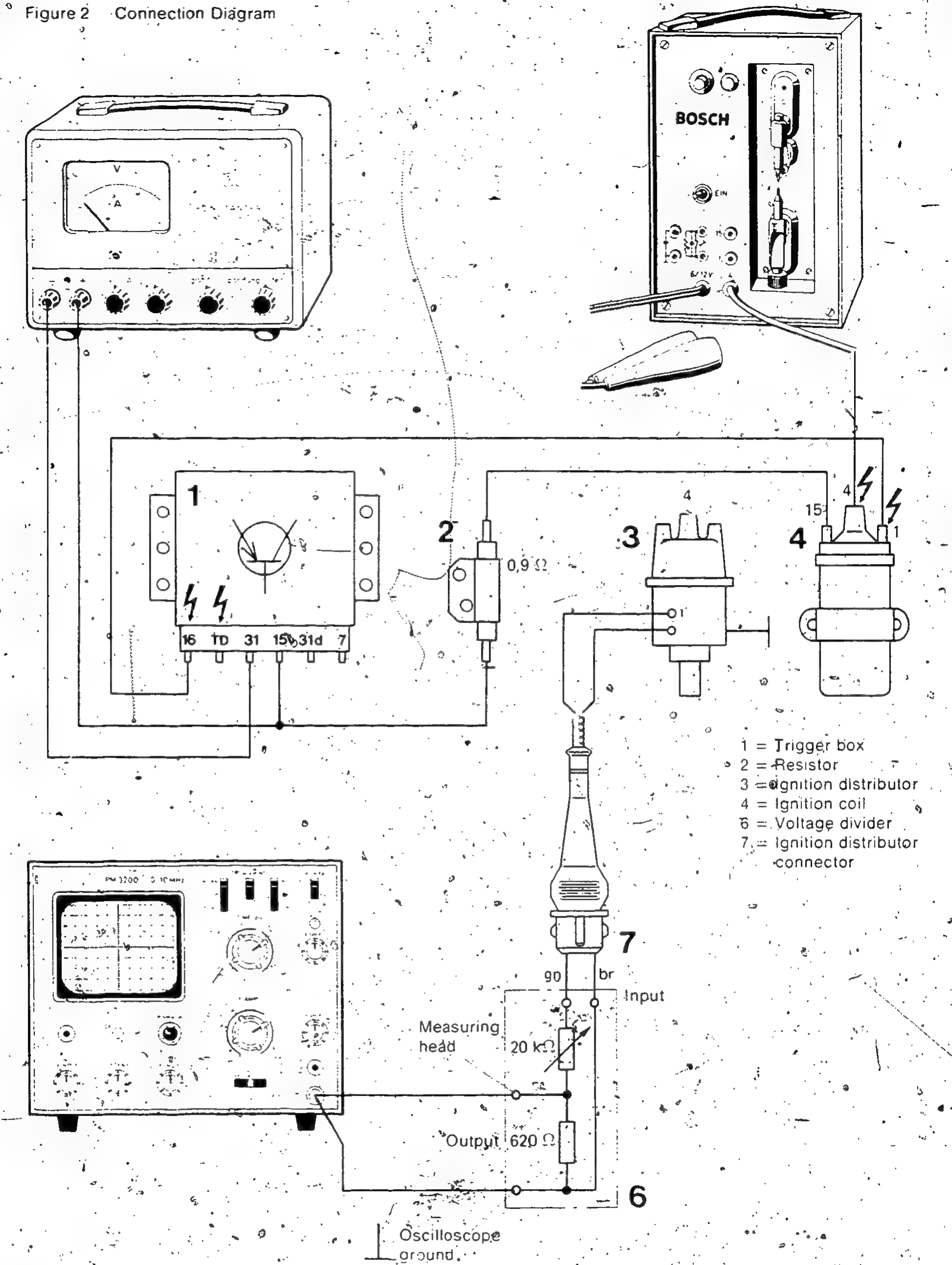


Figure 1 Voltage divider

E1

Figure 2 Connection Diagram



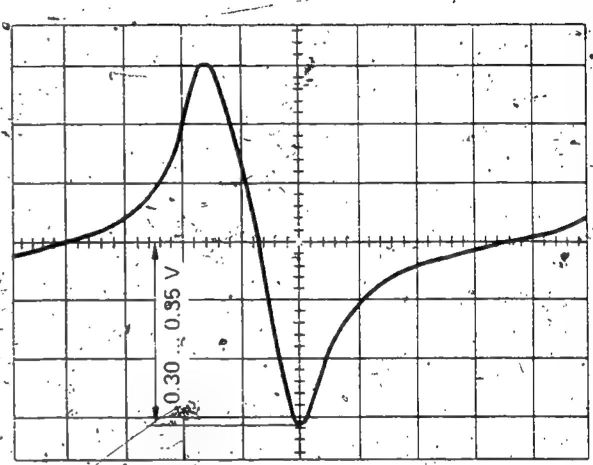
W-227/303
Seite 5

4.2 Set Up Complete Ignition System

Switch on the voltage stabilizer and set to 14 V.
Switch off stabilizer.
Set up ignition system, testers, including the voltage divider, (see section 2 for parts) and connect electrically in accordance with the connection diagram, Fig. 2.
Note: The colors of the conductors in the ignition distributor connector can be seen after pushing back the rubber sleeve.
Connect the spark gap: black clip to negative; do not connect red clip. Connect high-tension cable (terminal 4) to the ignition coil (terminal 4).

4.3 Set the Threshold Voltage

Using the appropriate flange, clamp the ignition distributor into the EFZV 10 ignition distributor test bench and drive at a speed of 250 min⁻¹.
Connect the ignition distributor to the voltage divider input (Fig. 2). Connect the oscilloscope with the voltage divider on 1:1 to the (user-fabricated) voltage divider output, and turn the potentiometer of the voltage divider until the oscilloscope reads 0.30 . . . 0.35 V, the negative half-wave being measured; see Fig. 3.
Note: The speed of the ignition distributor test bench must be continually checked and corrected as needed during the following measurement.



Settings:
y = 0.1 V/major division
x = 5 ms/major division
0.30 . . . 0.35 V

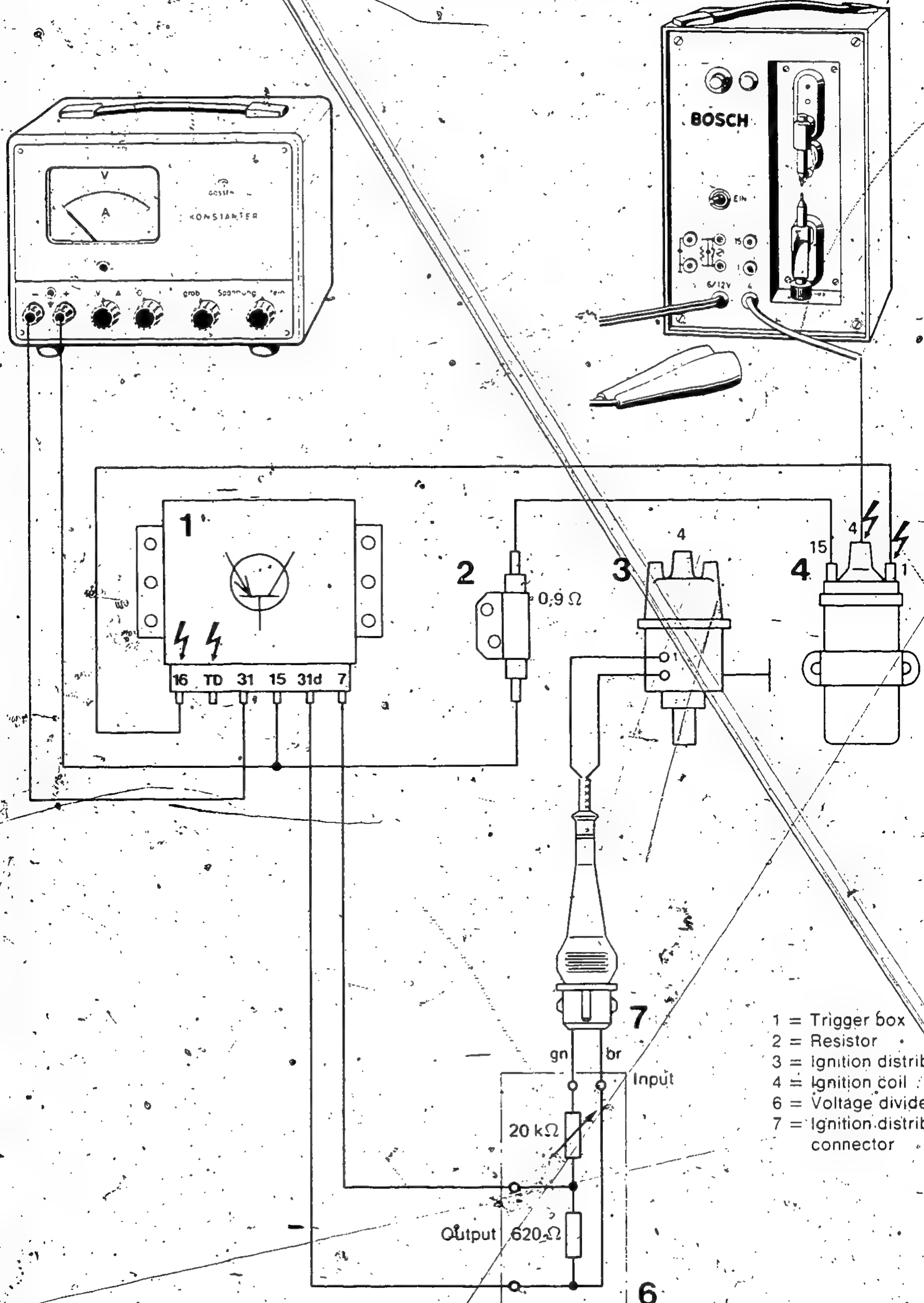
Figure 3 Threshold Voltage

5. Testing

5.1 Test the Input Stage

Disconnect the oscilloscope from the voltage divider output. Connect the output to the trigger box (do not mix up terminals), Fig. 4.
Set the spark gap to 8 mm.
Switch on the voltage stabilizer and set to 14 V.
The ignition spark must now be visible at the spark gap. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer.

Figure 4 Connection Diagram

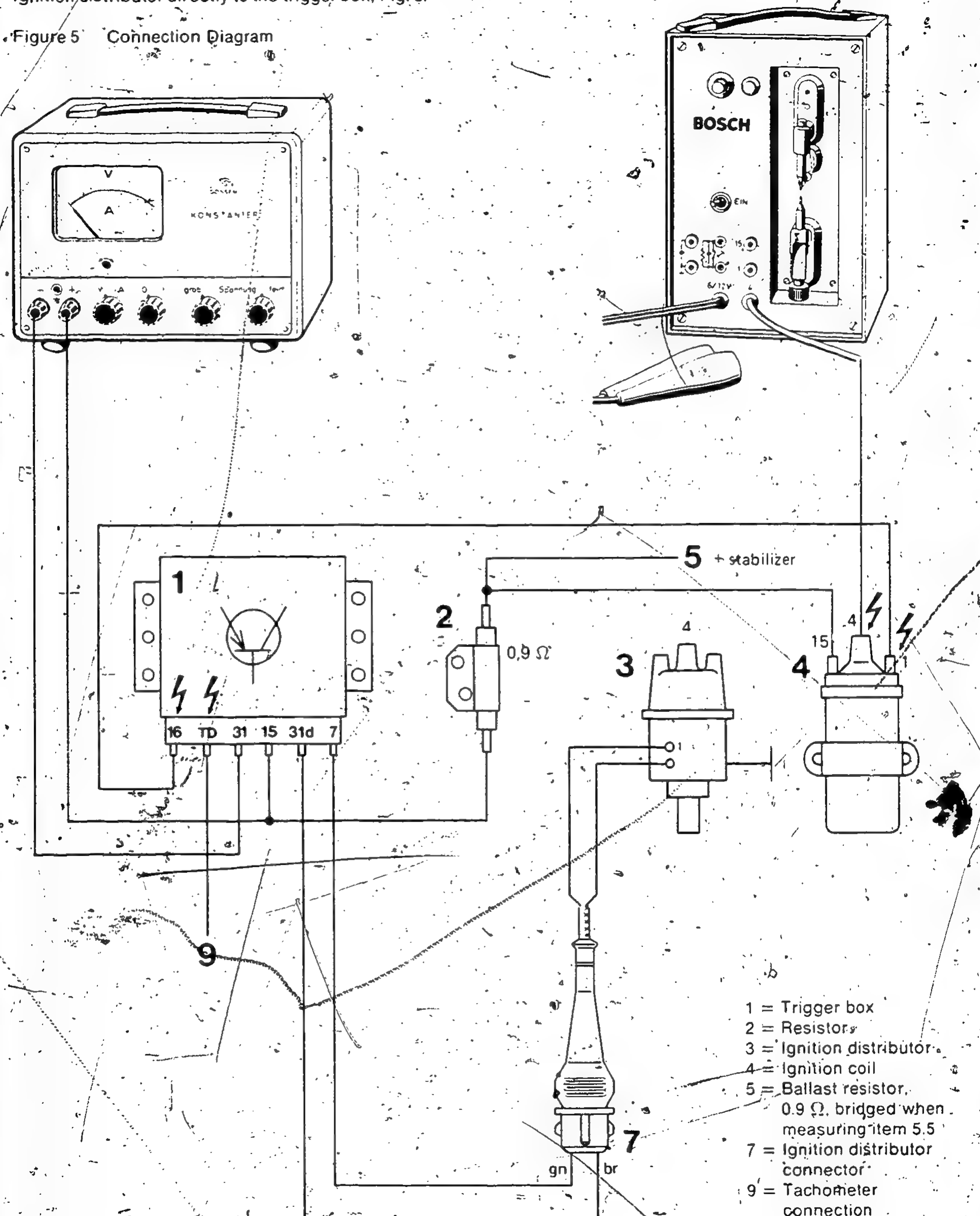


1 = Trigger box
2 = Resistor
3 = Ignition distributor
4 = Ignition coil
6 = Voltage divider
7 = Ignition distributor connector

5.2 Test the Transistor Output Stage (Zener voltage)

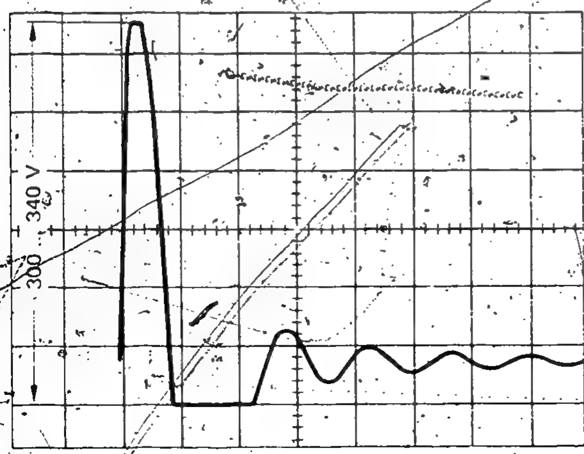
Disconnect the voltage divider and connect the ignition distributor directly to the trigger box, Fig. 5.

Figure 5 Connection Diagram



1 = Trigger box
2 = Resistor
3 = Ignition distributor
4 = Ignition coil
5 = Ballast resistor, 0.9 Ω, bridged when measuring item 5.5
7 = Ignition distributor connector
9 = Tachometer connection

Drive the ignition distributor at a speed of 250 min^{-1}.
Connect the oscilloscope to the ignition coil (terminal 1) and ground with the voltage divider on 1:10 (important: balance voltage divider).
Set spark gap to 8 mm.
Switch on voltage stabilizer and set to 14 V.
An ignition spark must be visible at the spark gap.
The oscillogram displayed must correspond to that shown in Fig. 6. The important quantity is the magnitude of the voltage displayed. This should be 300 . . . 340 V. If this is not the case, the trigger box is defective. Switch off the voltage stabilizer and disconnect the oscilloscope.



Settings:
y = 5 V/major division
x = 50 µs/major division
300 . . . 340 V

Figure 6 Transistor Output Stage Zener Voltage

5.3 Test the Transistor Output Stage (V[illegible])

Do not drive the ignition distributor.
Connect the voltmeter (measuring range 3 V) between the ignition coil (terminal 1) and ground. Switch on the voltage stabilizer and set to 14 V.
If the trigger box is not defective, the voltmeter should display 0.5 . . . 2.0 V. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer and disconnect the voltmeter.

5.4 Dwell-angle Measurements

Connect the dwell-angle tester to the ignition coil in accordance with the operating instructions. Switch on the voltage stabilizer and set to 14 V.
Drive the ignition distributor at a speed of 750 ± 50 rpm. The dwell angle should measure 33 . . . 51.
Drive the ignition distributor at a speed of 3500 ± 50 rpm. The dwell angle should measure 43 . . . 53.
If these specified values are not attained, the trigger box is defective.
Switch off the voltage stabilizer and disconnect the dwell-angle tester.

5.5 Operating Test at 6 Volts

Switch on the voltage stabilizer and set to 6 V. Switch off the stabilizer.
Bridge the ballast resistor as shown in connection diagram, Fig. 5, item 8.
Set the spark gap to 8 mm.
Drive the ignition distributor at a speed of 100 min^{-1}.
Switch on the voltage stabilizer.
Caution: With the ballast resistor bridged, the applied voltage should not exceed 10 V (trigger box is otherwise destroyed).
If the trigger box is not defective, sparks must be visible at the spark gap. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer. Disconnect the jumper from the 0.9 Ω ballast resistor (from the stabilizer).

5.6 Test Auxiliary Function (Tachometer Connection-TD)

Note: Older trigger boxes do not have the tachometer connection.
Drive the ignition distributor at a speed of approx. 1000 min^{-1}.
Set the spark gap to 8 mm.
Connect the tachometer in accordance with the operating instructions and connection diagram, Fig. 5.
Switch on the voltage stabilizer and set to 14 V.
The tachometer must now show **twice** the ignition distributor speed.
If no value is displayed, the trigger box is defective.

After-sales Service Instructions

Testing

22

VDT-W-227/305 B

Breakerless Transistorized Ignition System (TCI-i)

with trigger box 0 227 100 008

BOSCH After-sales Service Automotive Equipment

E7

Table of Contents

Automotive Equipment — After-sales Service
Department for Technical Publications KH/VDT
Postfach 50, D-7000 Stuttgart 1

Please direct questions and comments concerning the contents to our authorized representative in your country.

Printed in the Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne par
Robert Bosch GmbH.
(10. 76)

1. Danger of Accident on Semiconductor Ignition Systems

Please be sure to pass this bulletin on to your employees for their attention.

The increased demands made on their ignition systems by modern engines, and the wish for freedom from maintenance, led some time ago to manufacturers starting to equip their vehicles with simiconductor ignition systems as original equipment. In most cases, the performance of nearly all makes of such systems is higher than that of conventional systems, and further improvements are to be expected.
This means that semiconductor ignition systems have reached the point where contact with "live" parts or contacts (whether on the primary side or the secondary side) can prove fatal.

In this respect, we should like to point out to you that when working on or testing the ignition system, VDE regulations, in particular VDE-0104/7.67, should be complied with.
Note: The VDE regulation was sent to the Bosch organization with the technical information sheet VDT-I-227/102 B dated Feburary 3, 1976.

As a matter of principle, when working on such ignition systems the ignition is to be switched off and the battery disconnected. Included in such work are the following operations:

- Connection of engine testing equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).
- Replacement of ignition system parts (spark plugs, ignition coil, ignition distributor, H. T. ignition cables etc.).

If it is necessary to switch on the ignition in order to test the system or make adjustments on the engine (to the carburetor for instance), then lethal voltages are present throughout the **entire system**.

This means that the danger of accident exists not only at individual components in the system (e. g. ignition distributor, ignition coil, trigger box, ignition harness), but also at the wiring harness (e. g. connection for the tachometer, diagnostic connector), on terminals, and on test equipment.

By way of example, the danger points in the semiconductor ignition system are marked with red high-voltage arrows in the following connection diagrams.

Cable color code
br = brown
ge = yellow
gn = green
rt = red
sw = black

2. Testers and Auxiliary Materials Required

Voltage stabilizer ≥ 20 V/15 A	commercially available
Precision oscilloscope, e. g. Hameg 312 (with 1:1 and 1:10 voltage dividers)	commercially available
or	
Philips PM 3200 (with 1:1 and 1:10 voltage dividers)	commercially available
Ignition distributor test bench EFZV 10	0 680 123 001
Dwell-angle tester, e. g. EFAW 226	0 681 102 800
Voltmeter (3 V scale), e. g. EFAW 226	0 681 102 800
Spark gap (ignition coil and condenser tester EFAW 106 A)	0 681 100 001
or	
Single spark gap EF 1177/7	1 684 531 000
Complete ignition system consisting of:	
Trigger box (test specimen)	0 227 100 001
Ignition distributor (6 cyl. 600 Ω pulse generator)	0 237 300 001
Ignition coil (KW 12 V)	0 221 122 003
Ballast resistor (0.4 0.6 Ω)	0 227 900 101
Connecting parts set (for the trigger box) consisting of: 1 protective cap, 1 plug connector, 7 contact springs	1 227 000 024
1 potentiometer 20 kΩ, 1/3 W (linear)	commercially available
1 resistor 620 Ω, 1/3 W ± 5%	commercially available
approx. 1.5 m cable, 1.5 mm², e. g.	6 210 150 150
2 ignition-cable terminals for the ignition coil	1 901 353 126
2 blade receptacles for ballast resistor	1 901 355 881

3. Workshop Instructions

- Specified parts of the complete ignition system, including the connecting parts set, should always be used to avoid **destruction and incorrect measurement.**
- The measurements must be made at room temperature.
- It is important that the measurements be made at the respective voltage specified.
- The ignition distributor specified for the test must be checked at regular intervals in accordance with the prescribed ignition distributor test instructions.
- The spark gap must be connected and **set to 8 mm** for the entire measuring procedure. The spark gap must be in perfect condition.

4. Preparations for Testing

4.1 Making Your Own Voltage Divider

The following parts are needed:

1 potentiometer 20 kΩ, 1/3 W (linear).
1 resistor 620 Ω, 1/3 W ± 5%

Connect parts electrically, see Fig. 1.

Note: To simplify testing, the voltage divider can be permanently mounted on a board and equipped with connector bushings.

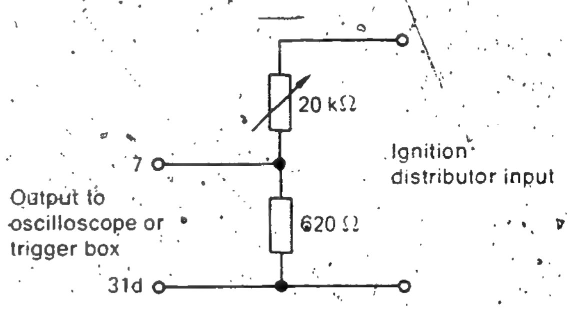
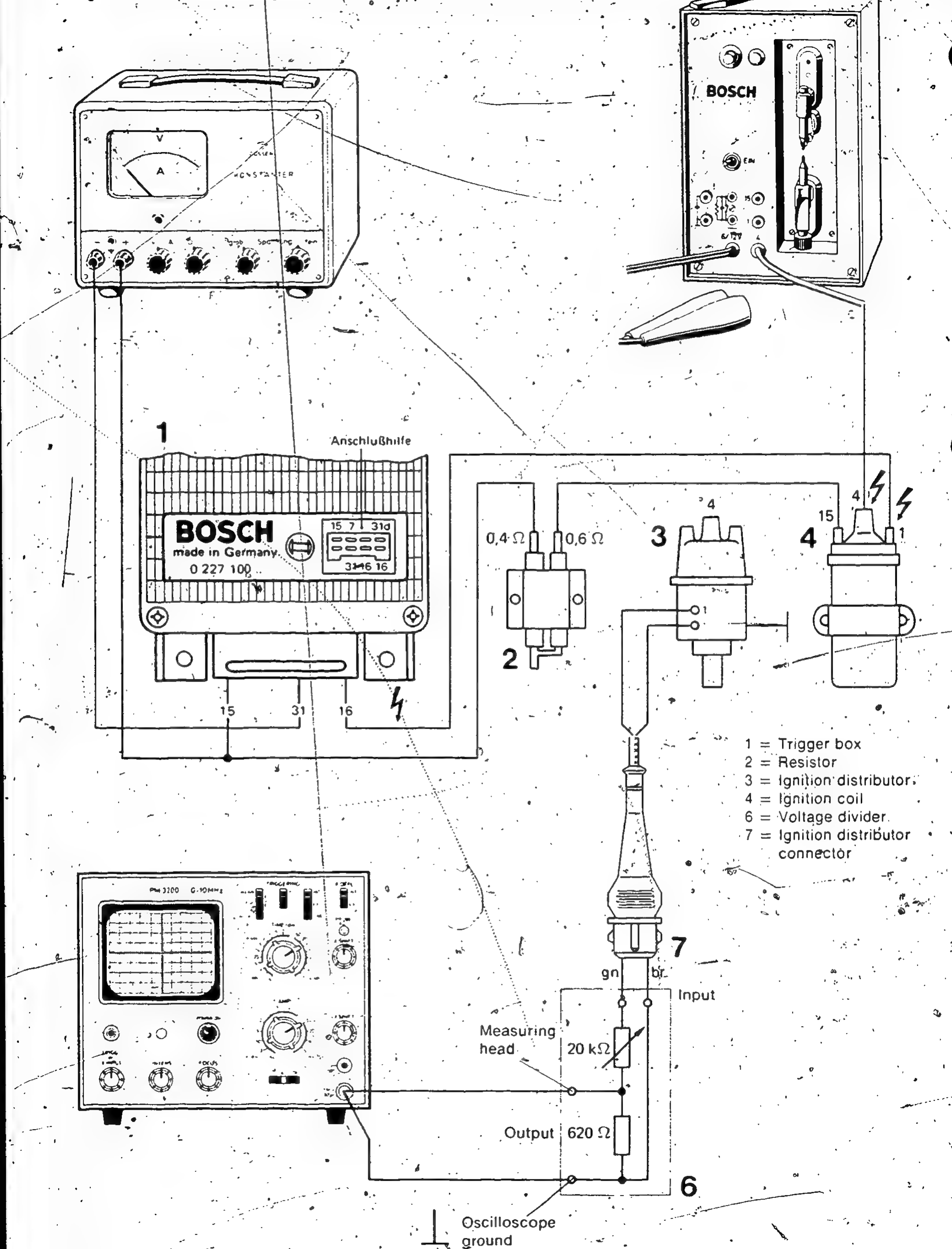


Figure 1 Voltage divider

Seite 4

Figure 2 Connection Diagram



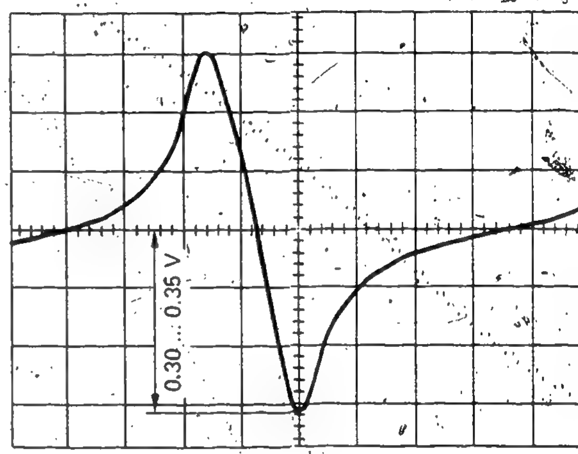
W-227/305
Seite 5

4.2 Set Up Complete Ignition System

Switch on the voltage stabilizer and set to 14 V.
Switch off stabilizer.
Set up ignition system, testers, including the voltage divider, (see section 2 for parts) and connect electrically in accordance with the connection diagram, Fig. 2.
Note: The colors of the conductors in the ignition distributor connector can be seen after pushing back the rubber sleeve.
Connect the spark gap: black clip to negative; do not connect red clip. Connect high-tension cable (terminal 4) to the ignition coil (terminal 4).

4.3 Set the Threshold Voltage

Using the appropriate flange, clamp the ignition distributor into the EFZV 10 ignition distributor test bench and drive at a speed of 250 min^{-1}.
Connect the ignition distributor to the voltage divider input (Fig. 2). Connect the oscilloscope with the voltage divider on 1:1 to the (user-fabricated) voltage divider output, and turn the potentiometer of the voltage divider until the oscilloscope reads 0.30 . . . 0.35 V, the negative half-wave being measured; see Fig. 3.
Note: The speed of the ignition distributor test bench must be continually checked and corrected as needed during the following measurement.



Settings:
y = 0.1 V/major division
x = 5 ms/major division.
0.30 . . . 0.35 V

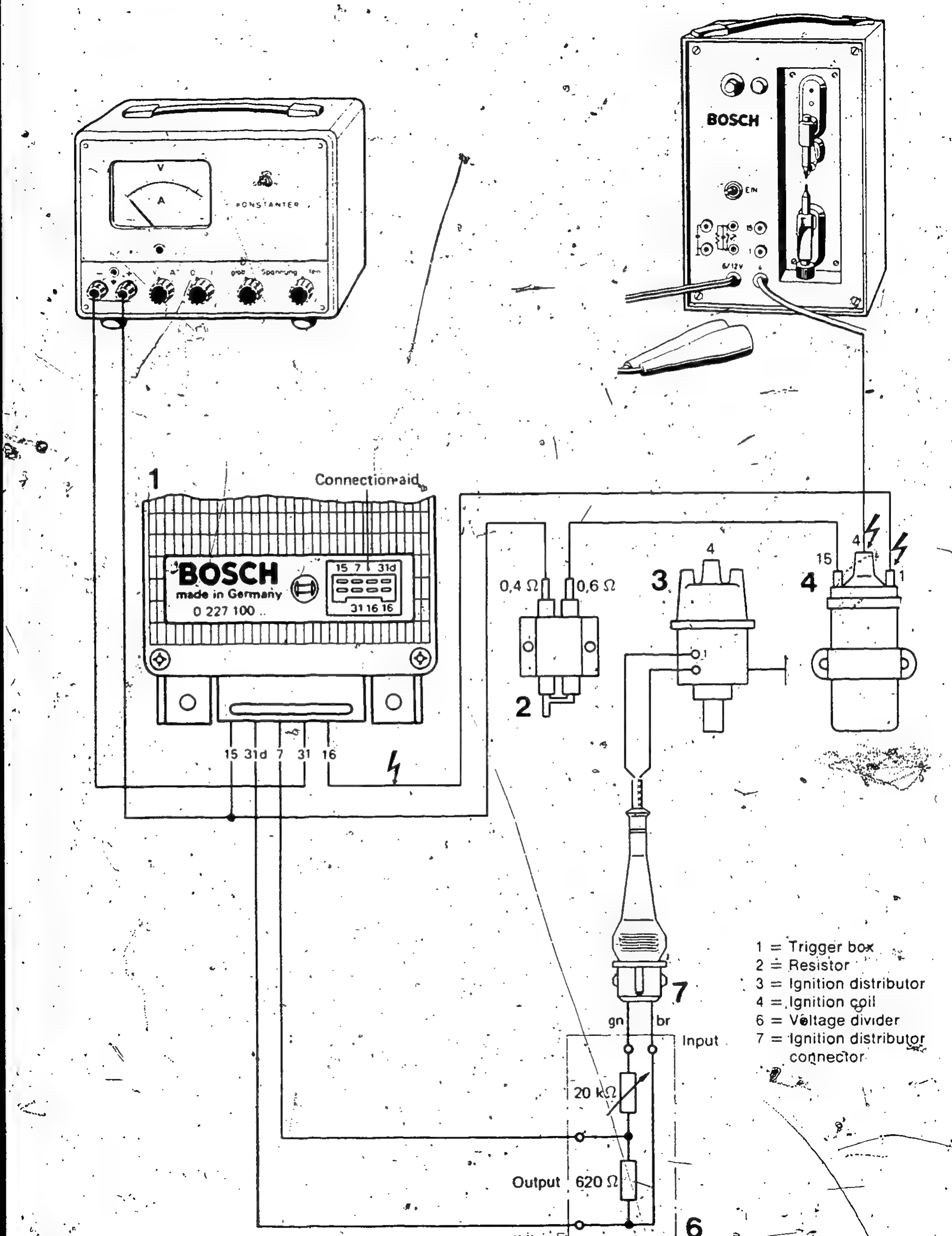
Figure 3 Threshold Voltage

5. Testing

5.1 Test the Input Stage

Disconnect the oscilloscope from the voltage divider output. Connect the output to the trigger box (do not mix up terminals), Fig. 4.
Set the spark gap to 8 mm.
Switch on the voltage stabilizer and set to 14 V.
The ignition spark must now be visible at the spark gap. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer.

Figure 4 Connection Diagram



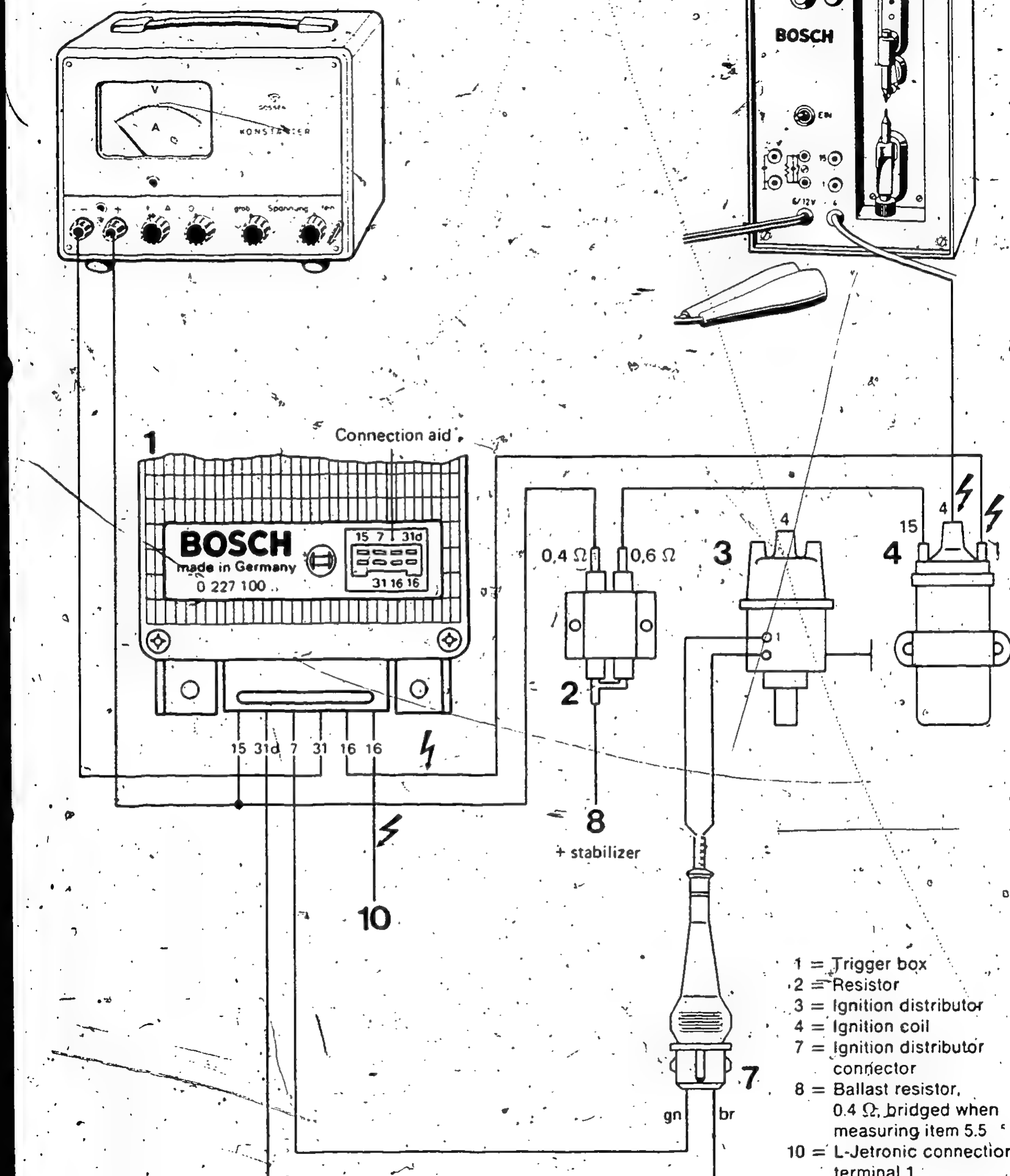
1 = Trigger box
2 = Resistor
3 = Ignition distributor
4 = Ignition coil
6 = Voltage divider
7 = Ignition distributor connector

W-227/305
Seite 7

5.2 Test the Transistor Output Stage (Zener voltage)

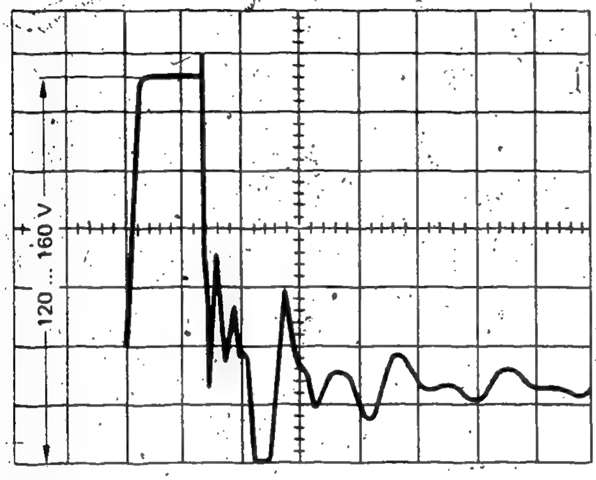
Disconnect the voltage divider and connect the ignition distributor directly to the trigger box; Fig. 5.

Figure 5 Connection Diagram



1 = Trigger box
2 = Resistor
3 = Ignition distributor
4 = Ignition coil
7 = Ignition distributor connector
8 = Ballast resistor, 0.4 Ω, bridged when measuring item 5.5
10 = L-Jetronic connection terminal 1

Drive the ignition distributor at a speed of 250 min⁻¹.
Connect the oscilloscope to the ignition coil (terminal 1) and ground with the voltage divider on 1:10 (important: balance voltage divider).
Set spark gap to 8 mm.
Switch on voltage stabilizer and set to 14 V.
An ignition spark must be visible at the spark gap.
The oscillogram displayed must correspond to that shown in Fig. 6. The important quantity is the magnitude of the voltage displayed. This should be 120 . . . 160 V. If this is not the case, the trigger box is defective. Switch off the voltage stabilizer and disconnect the oscilloscope.



Settings:
y = 2 V/major division
x = 20 μs/major division
120 . . . 160 V

Figure 6 Transistor Output Stage Zener Voltage

5.3 Test the Transistor Output Stage ($V_{CE\,sat}$)

Do not drive the ignition distributor.
Connect the voltmeter (measuring range 3 V) between the ignition coil (terminal 1) and ground. Switch on the voltage stabilizer and set to 14 V.
If the trigger box is not defective, the voltmeter should display 0.5 . . . 2.0 V. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer and disconnect the voltmeter.

5.4 Dwell-angle Measurements

Connect the dwell-angle tester to the ignition coil in accordance with the operating instructions. Switch on the voltage stabilizer and set to 14 V.
Drive the ignition distributor at a speed of 750 ± 50 min⁻¹. The dwell angle should measure 33° . . . 51°.
Drive the ignition distributor at a speed of 3500 ± 50 min⁻¹. The dwell angle should measure 43° . . . 53°.
If these specified values are not attained, the trigger box is defective.
Switch off the voltage stabilizer and disconnect the dwell-angle tester.

5.5 Operating Test at 6 Volts

Switch on the voltage stabilizer and set to 6 V. Switch off the stabilizer.
Bridge the ballast resistor as shown in connection diagram, Fig. 5, item 8.
Set the spark gap to 8 mm.
Drive the ignition distributor at a speed of 100 min⁻¹.
Switch on the voltage stabilizer.
Caution: With the ballast resistor bridged, the applied voltage should not exceed 10 V (trigger box is otherwise destroyed).
If the trigger box is not defective, sparks must be visible at the spark gap. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer. Disconnect the jumper from the 0.4 Ω ballast resistor (from the stabilizer).

5.6 Test Auxiliary Function (L-Jetronic Connection Terminal 1)

Drive the ignition distributor at a speed of approx. 1000 min⁻¹.
Set the spark gap to 8 mm.
Connect the tachometer in accordance with the operating instructions and connection diagram, Fig. 5.
Switch on the voltage stabilizer and set to 14 V.
The tachometer must now indicate **twice** the ignition distributor speed.
If **no** value is indicated, the trigger box is defective.

After-sales Service Instructions

Testing

22

VDT-W-227/306 En
Ed. 2

Breakerless Transistorized Ignition System (TCI-i)

with trigger box 0 227 100 010

BOSCH After-sales Service Automotive Equipment

E15

Contents

Caution!

High-energy ignition system. Dangerous primary and secondary voltages.

Please take note of our technical bulletin VDT-I-227/102 En

Automotive Equipment – After-sales Service
Department for Technical Publications KH/VDT
Postfach 50, D-7000 Stuttgart 1

Published by: After-sales Service
Department for Training and Technology (KH/VSK)
Please direct questions and comments concerning the contents to our authorized representative in your country.

Printed in the Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne
par Robert Bosch GmbH.
(12.1978)

E16

E 16

E17

1. Testers and Auxiliary Materials Required

Voltage stabilizer $\geqq$ 20 V/15 A	commercially available
Precision oscilloscope, e. g. Hameg 312 (with 1 : 1 and 1 : 10 probes)	commercially available
or	
Philips PM 3200 (with 1 : 1 and 1 : 10 probes)	commercially available
Ignition distributor test bench EFZV 10	0 680 123 001
Dwell-angle tester, e. g. MOT 002.00	0 684 000 200
Voltmeter (3 V scale), e. g. MOT 002.00	0 684 000 200
Spark gap (ignition coil and condenser tester EFAW 106 A)	0 681 100 001
or	
Single spark gap EF 1177/7	1 684 531 000
Complete ignition system consisting of:	
Trigger box (test specimen)	0 227 100 010
Ignition distributor (4 cyl. 1.1 kΩ pulse generator)	0 237 001 001
or	0 237 002 001
or	0 237 002 002
Ignition coil (KW 12 V)	0 221 122 008
Ballast resistor (0.4/0.6 Ω)	0 227 900 101
Connecting parts (for the trigger box)	2 227 000 101
Approx. 1.5 m cable, 1.5 mm² e. g.	6 210 150 150
1 Ignition-coil cable terminal dia. 5 mm	1 901 353 126
1 Ignition-coil cable terminal dia. 6 mm	1 901 353 131
2 blade receptacles for ballast resistor	1 901 355 881
1 potentiometer 20 kΩ, 1/3 W (linear)	commercially available
1 resistor 1.2 kΩ, 1/3 W ± 5 %	commercially available

E 17

2. Workshop Instructions

- Specified parts of the complete ignition system, including the connecting parts set, should always be used to avoid **destruction** and **incorrect measurement.**
- The measurements must be made at room temperature.
- It is important that the measurements be made at the respective voltage specified.
- The ignition distributor specified for the test must be checked at regular intervals in accordance with the prescribed ignition distributor test instructions.
- The spark gap must be connected and **set to 8 mm** for the entire measuring procedure. The spark gap must be in perfect condition.

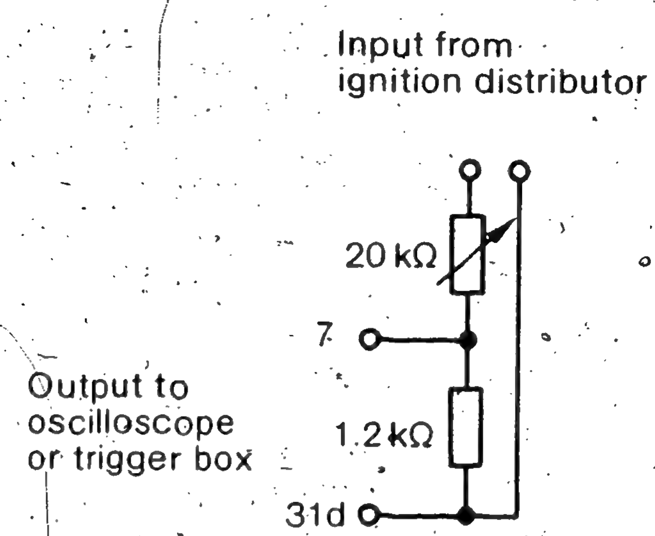


Figure 1 Voltage divider

3. Preparations for Testing

3.1 Marking Your Own Voltage Divider

The following parts are needed:

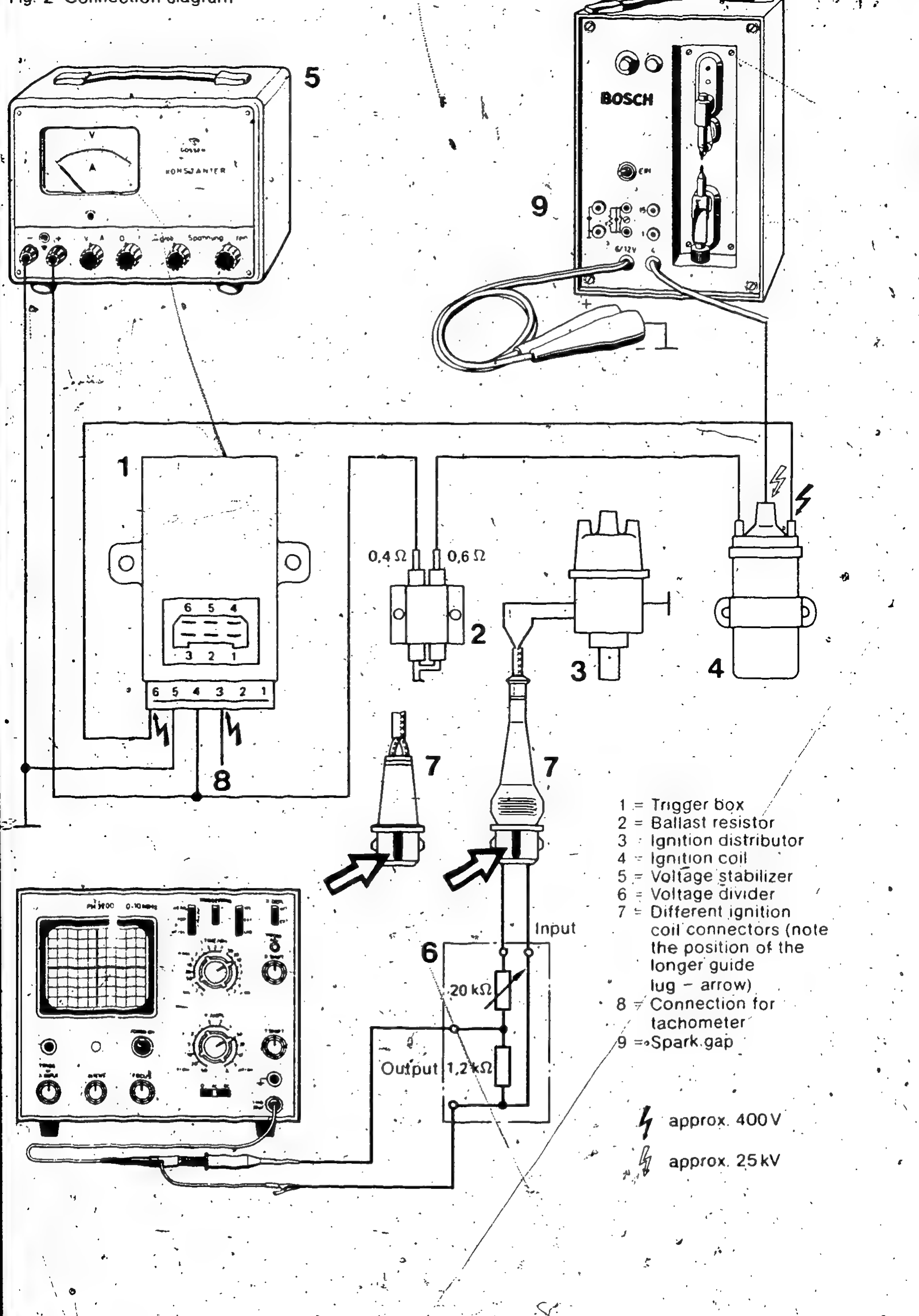
1 potentiometer 20 kΩ, ⅓ W (linear)
1 resistor 1.2 kΩ, ⅓ W ±5%

Connect parts electrically, see Fig. 1.

Note: To simplify testing, the voltage divider can be permanently mounted on a board and equipped with connector bushings.

E 19

Fig. 2 Connection diagram



1 = Trigger box
2 = Ballast resistor
3 = Ignition distributor
4 = Ignition coil
5 = Voltage stabilizer
6 = Voltage divider
7 = Different ignition coil connectors (note the position of the longer guide lug – arrow)
8 = Connection for tachometer
9 = Spark gap

approx. 400 V

approx. 25 kV

3.2 Set Up Complete Ignition System

Switch on the voltage stabilizer and set to 14 V.
Switch off stabilizer.
Set up ignition system, testers, including the voltage divider, (see section 1 for parts) and connect electrically in accordance with the connection diagram, Fig. 2.
Connect the spark gap: **black clip to negative**; do not connect red clip. Connect high-tension cable (terminal 4) to the ignition coil (terminal 4).

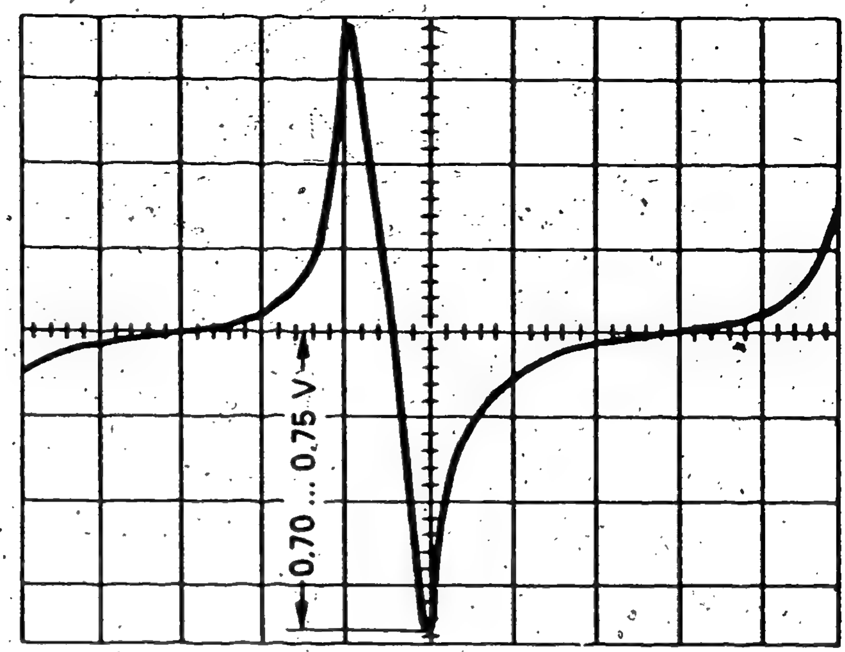


Figure 3 Threshold Voltage

Settings:
y = 0.2 V/major division
x = 10 ms/major division
0.70 ... 0.75 V

3.3 Set the Threshold Voltage

Using the appropriate flange, clamp the ignition distributor into the EFZV 10 ignition distributor test bench and drive at a speed of 250 min^{-1}.
Connect the ignition distributor to the voltage divider input (Fig. 2).
Connect the oscilloscope with the 1:1 probe to the (user-fabricated) voltage divider output, and turn the potentiometer of the voltage divider until the oscilloscope reads 0.70 ... 0.75 V, the **negative** half-wave being measured; see Fig. 3.

Note: The speed of the ignition distributor test bench must be continually checked and corrected as needed during the following measurement.

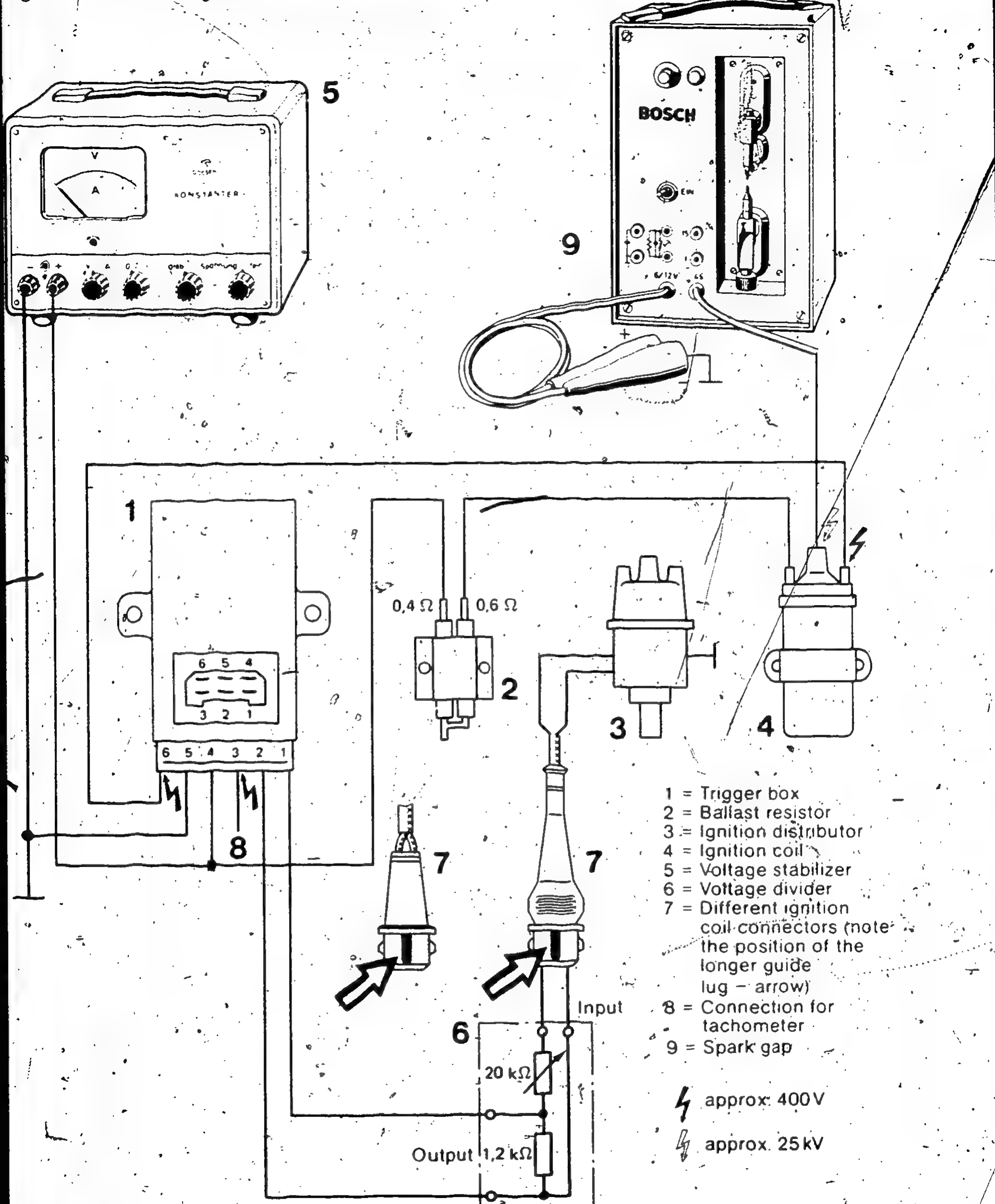
4. Testing

4.1 Test the Input Stage

Disconnect the oscilloscope from the voltage divider output.
Connect the output to the trigger box (do not mix up terminals), Fig. 4.
Set the spark gap to 8 mm.
Switch on the voltage stabilizer and set to 14 V.
The ignition spark must now be visible at the spark gap. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer.

W-2271306

Fig. 4 Connection diagram



1 = Trigger box
2 = Ballast resistor
3 = Ignition distributor
4 = Ignition coil
5 = Voltage stabilizer
6 = Voltage divider
7 = Different ignition coil connectors (note the position of the longer guide lug – arrow)
8 = Connection for tachometer
9 = Spark gap

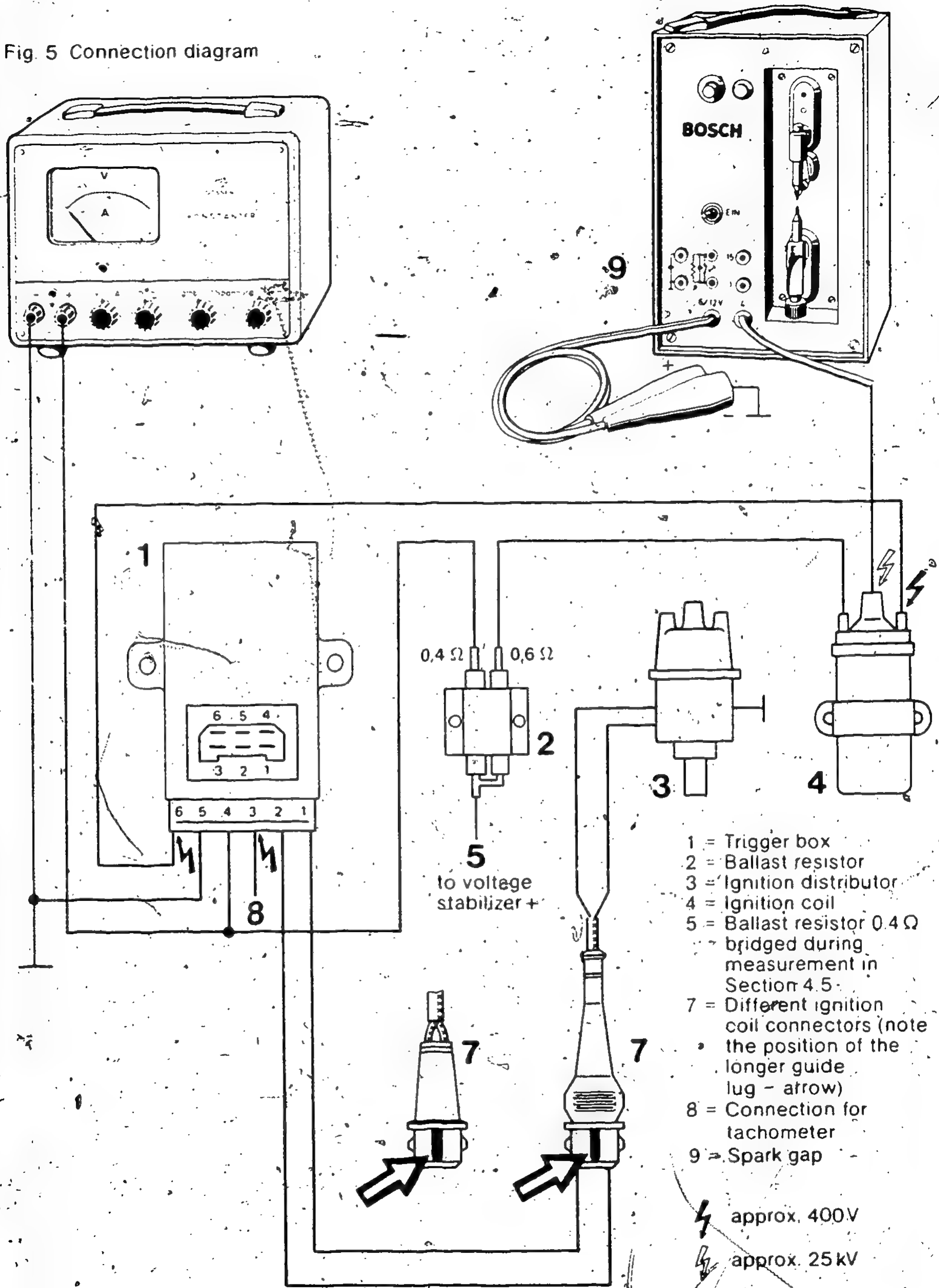
approx. 400 V

approx. 25 kV

4.2 Test the transistor output stage (Zener voltage)

Remove the voltage divider and connect the ignition distributor directly to the trigger box (Fig. 5)

Fig. 5 Connection diagram



1 = Trigger box
2 = Ballast resistor
3 = Ignition distributor
4 = Ignition coil
5 = Ballast resistor 0.4 Ω bridged during measurement in Section 4.5
7 = Different ignition coil connectors (note the position of the longer guide lug – arrow)
8 = Connection for tachometer
9 = Spark gap

approx. 400 V

approx. 25 kV

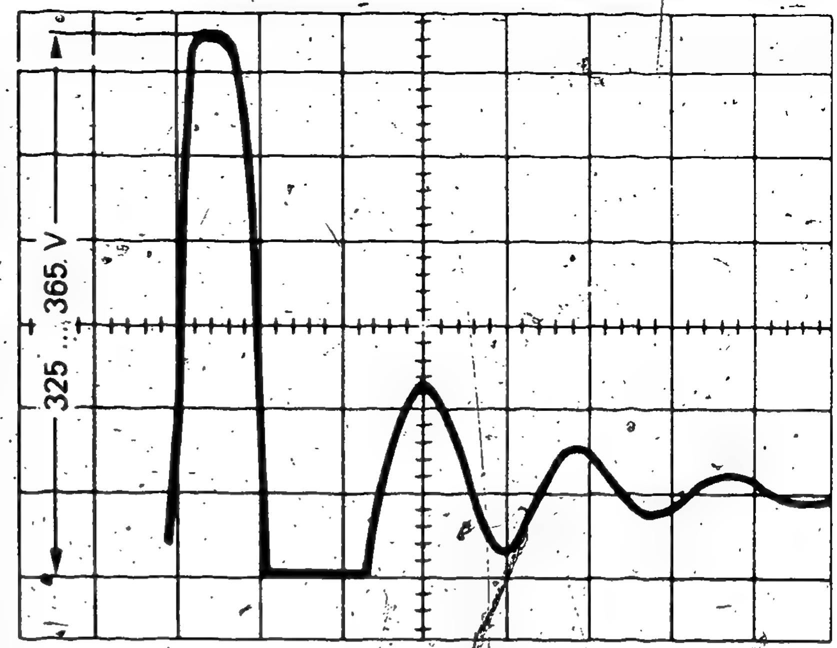


Figure 6 Transistor Output Stage Zener Voltage

Settings:
y = 5 V/major division
x = 50 µs/major division
325 ... 365 V

Drive the ignition distributor at a speed of 250 min^{-1}.
Connect the oscilloscope to the ignition coil (terminal 1) and ground with the 1:10 probe (important: balance probe).
Set spark gap to 8 mm.
Switch on voltage stabilizer and set to 14 V.
An ignition spark must be visible at the spark gap.
The oscillogram displayed must correspond to that shown in Fig. 6.
The important quantity is the magnitude of the voltage displayed.
This should be 325 ... 365 V. If this is not the case, the trigger box is defective. Switch off the voltage stabilizer and disconnect the oscilloscope.

4.3 Test the Transistor Output Stage ($V_{CE\ sat}$)

Do not drive the ignition distributor.
Connect the voltmeter (measuring range 3 V) between the ignition coil (terminal 1) and ground. Switch on the voltage stabilizer and set to 14 V.
If the trigger box is not defective, the voltmeter should display 0.5 ... 2.0 V. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer and disconnect the voltmeter.

W-2271306

4.4 Dwell-angle Measurements

Connect the dwell-angle tester to the ignition coil in accordance with the operating instructions. Switch on the voltage stabilizer and set to 14 V.
Drive the ignition distributor at a speed of $750 \pm 50\,min^{-1}$. The dwell angle should measure 52° ... 70°.
Drive the ignition distributor at a speed of $3500 \pm 50\,min^{-1}$.
The dwell angle should measure 57° ... 76°.
If these specified values are not attained, the trigger box is defective.
Switch off the voltage stabilizer and disconnect the dwell-angle tester.

4.5 Operating Test at 6 Volts

Switch on the voltage stabilizer and set to 6V. Switch off the stabilizer.
Bridge the ballast resistor as shown in connection diagram, Fig. 5, item 5.
Set the spark gap to 8mm.
Drive the ignition distributor at a speed of 100 min⁻¹.
Switch on the voltage stabilizer.
Caution: With the ballast resistor bridged, the applied voltage should not exceed 10V (trigger box is otherwise destroyed).
If the trigger box is not defective, sparks must be visible at the spark gap. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer. Disconnect the jumper from the 0.4 Ω ballast resistor (from the stabilizer).

F1

F1

After-sales Service Instructions

Testing

22

VDT-W-227/310 En
Ed. 2

Breakerless Transistorized Ignition System (TCI-i)

with trigger box 0 227 100 014

BOSCH After-sales Service Automotive Equipment

F2

Contents

Caution!

High-energy ignition system. Dangerous primary and secondary voltages.

Please take note of our technical bulletin VDT-I-227/102 En

Automotive Equipment – After-sales Service
Department for Technical Publications KH/VDT,
Postfach 50, D-7000 Stuttgart 1

Published by: After-sales Service
Department for Training and Technology (KH/VKS)
Please direct questions and comments concerning the contents to our authorized representative in your country.

Printed in the Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne
par Robert Bosch GmbH.
(12. 1978)

F3

1. Testers and Auxiliary Materials Required

Voltage stabilizer ≧20 V/15 A	commercially available
Precision oscilloscope, e. g. Hameg 312 (with 1 : 1 and 1 : 10 probes)	commercially available
or	
Philips PM 3200 (with 1 : 1 and 1 : 10 probes)	commercially available
Ignition distributor test bench EFZV 10	0 680 123 001
Dwell-angle tester, e. g. MOT 002.00	0 684 000 200
Voltmeter (3 V scale), e. g. MOT 002.00	0 684 000 200
Spark gap (ignition coil and condenser tester EFAW 106 A)	0 681 100 001
or	
Single spark gap EF 1177/7	1 684 531 000
Complete ignition system consisting of: Trigger box (test specimen)	0 227 100 014
Ignition distributor (4 cyl. 1.1 kΩ pulse generator)	0 237 001 001
or	0 237 002 001
or	0 237 002 002
Ignition coil (KW 12 V)	0 221 122 012
or	0 221 122 014
Ballast resistor (0.9 Ω)	0 227 900 002
Connecting parts (for the trigger box)	2 227 000 100
Approx. 1.5 m cable, 1.5 mm² e. g.	6 210 150 150
1 ignition-coil cable terminal dia. 5 mm	1 901 353 126
2 blade receptacles for ballast resistor	1 901 355 881
1 potentiometer 20 kΩ, 1/3 W (linear)	commercially available
1 resistor 1.2 kΩ, 1/3 W ± 5%	commercially available

2. Workshop Instructions

- Specified parts of the complete ignition system, including the connecting parts set, should always be used to avoid **destruction** and **incorrect measurement.**
- The measurements must be made at room temperature.
- It is important that the measurements be made at the respective voltage specified.
- The ignition distributor specified for the test must be checked at regular intervals in accordance with the prescribed ignition distributor test instructions.
- The spark gap must be connected and **set to 8 mm** for the entire measuring procedure. The spark gap must be in perfect condition.

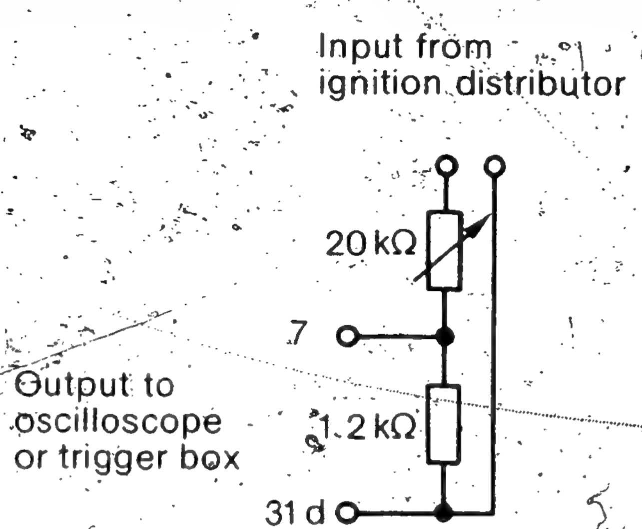


Figure 1 Voltage divider

3. Preparations for Testing

3.1 Making Your Own Voltage Divider

The following parts are needed:

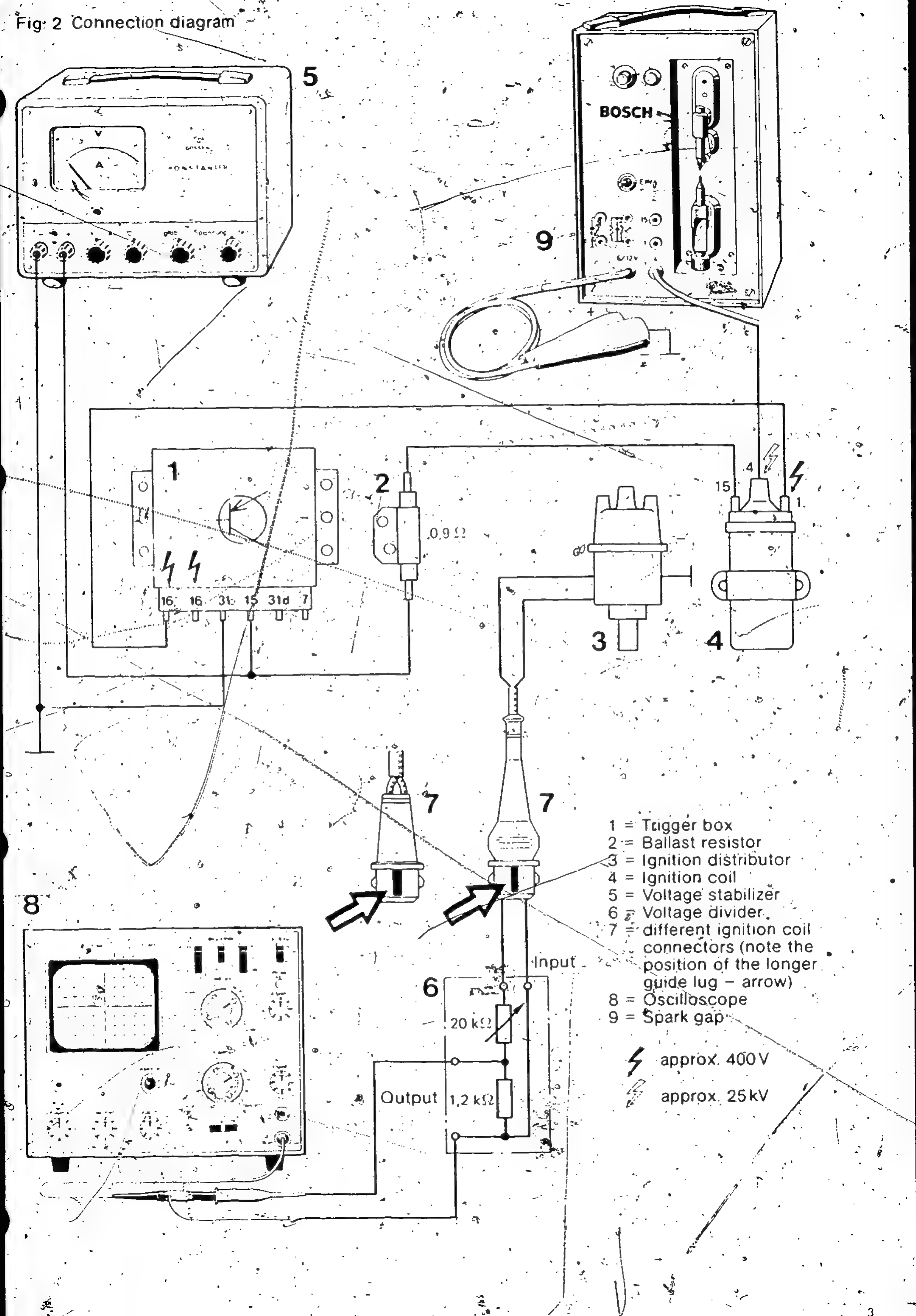
1 potentiometer 20 kΩ, ⅓ W (linear)
1 resistor 1.2 kΩ, ⅓ W ± 5%

Connect parts electrically, see Fig. 1.

Note: To simplify testing, the voltage divider can be permanently mounted on a board and equipped with connector bushings.

F 6

Fig. 2 Connection diagram



1 = Trigger box
2 = Ballast resistor
3 = Ignition distributor
4 = Ignition coil
5 = Voltage stabilizer
6 = Voltage divider
7 = different ignition coil connectors (note the position of the longer guide lug – arrow)
8 = Oscilloscope
9 = Spark gap

⚡ approx. 400 V

⚡ approx. 25 kV

F7

3.2 Set Up Complete Ignition System

Switch on the voltage stabilizer and set to 14 V.
Switch off stabilizer.
Set up ignition system, testers, including the voltage divider, (see section 1 for parts) and connect electrically in accordance with the connection diagram, Fig. 2.
Connect the spark gap: **black clip to negative;** do not connect red clip. Connect high-tension cable (terminal 4) to the ignition coil (terminal 4).

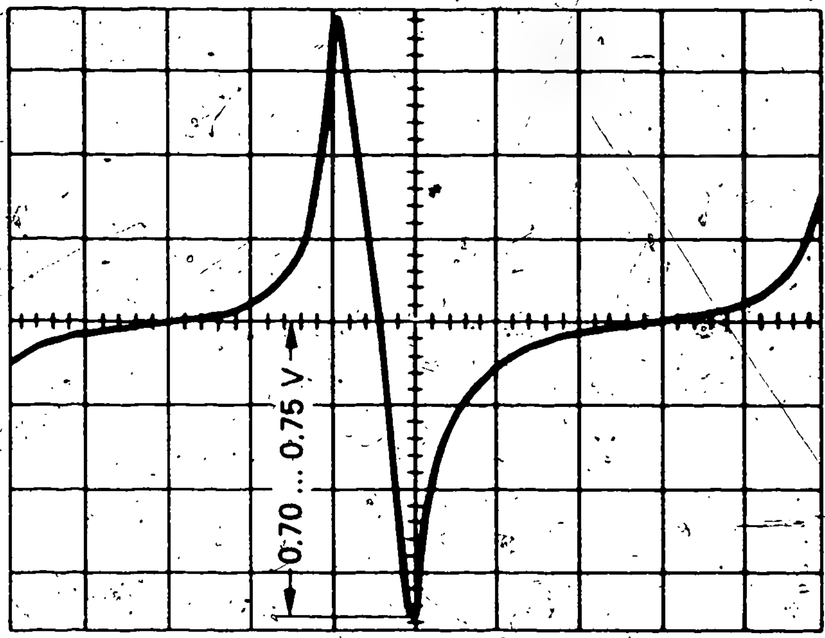


Figure 3 Threshold Voltage

Settings:
y = 0.2 V/major division
x = 10 ms/major division
0.70 ... 0.75 V

3.3 Set the Threshold Voltage

Using the appropriate flange, clamp the ignition distributor into the EFZV 10 ignition distributor test bench and drive at a speed of 250 min^{-1}.
Connect the ignition distributor to the voltage divider input (Fig. 2).
Connect the oscilloscope with the 1:1 probe to the (user-fabricated) voltage divider output, and turn the potentiometer of the voltage divider until the oscilloscope reads 0.70 ... 0.75 V, the **negative** half-wave being measured; see Fig. 3.

Note: The speed of the ignition distributor test bench must be continually checked and corrected as needed during the following measurement.

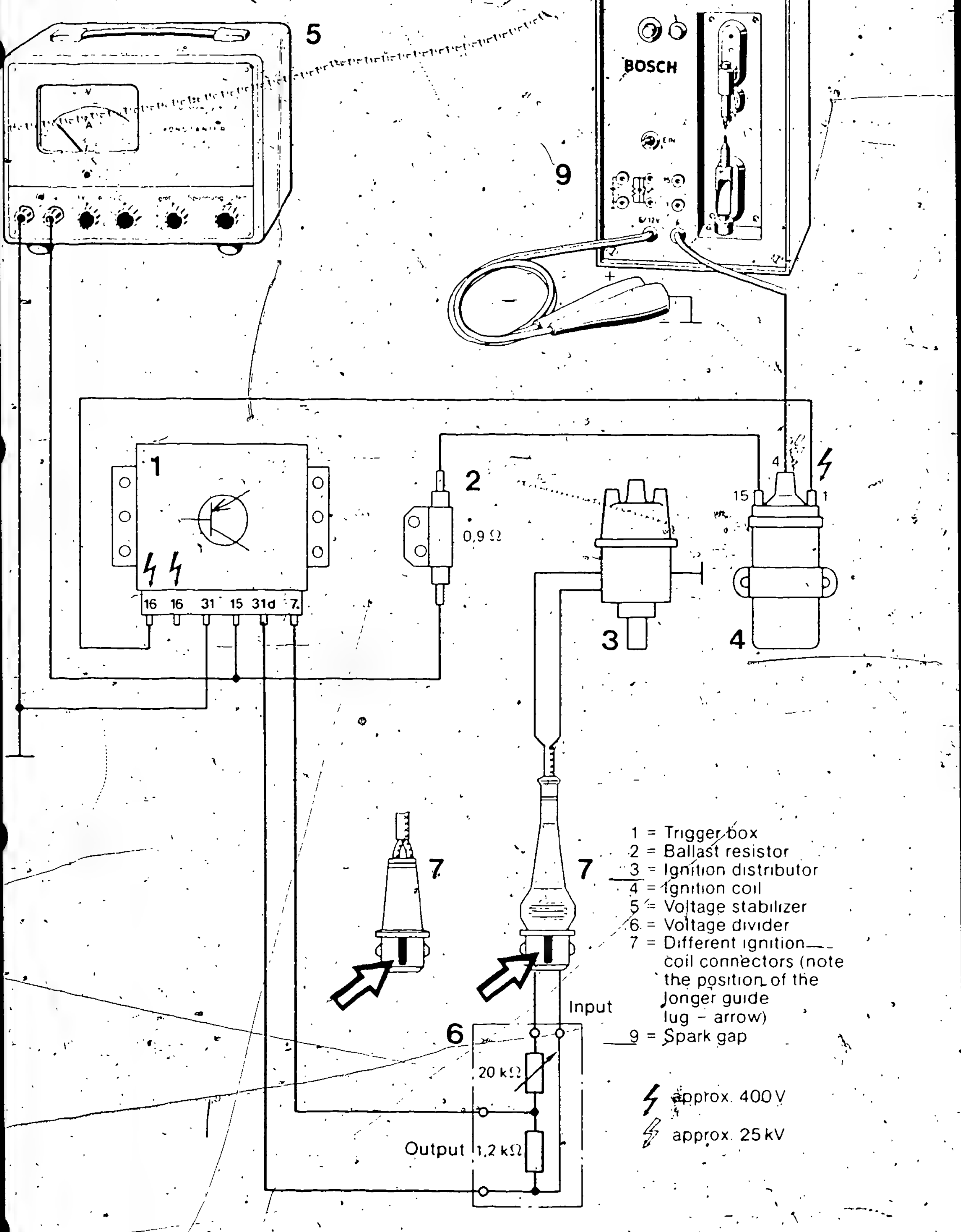
4. Testing

4.1 Test the Input Stage

Disconnect the oscilloscope from the voltage divider output.
Connect the output to the trigger box (do not mix up terminals), Fig. 4.
Set the spark gap to 8 mm.
Switch on the voltage stabilizer and set to 14 V.
The ignition spark must now be visible at the spark gap. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer.

2/10

Fig. 4 Connection diagram



1 = Trigger box
2 = Ballast resistor
3 = Ignition distributor
4 = Ignition coil
5 = Voltage stabilizer
6 = Voltage divider
7 = Different ignition coil connectors (note the position of the longer guide lug – arrow)
9 = Spark gap

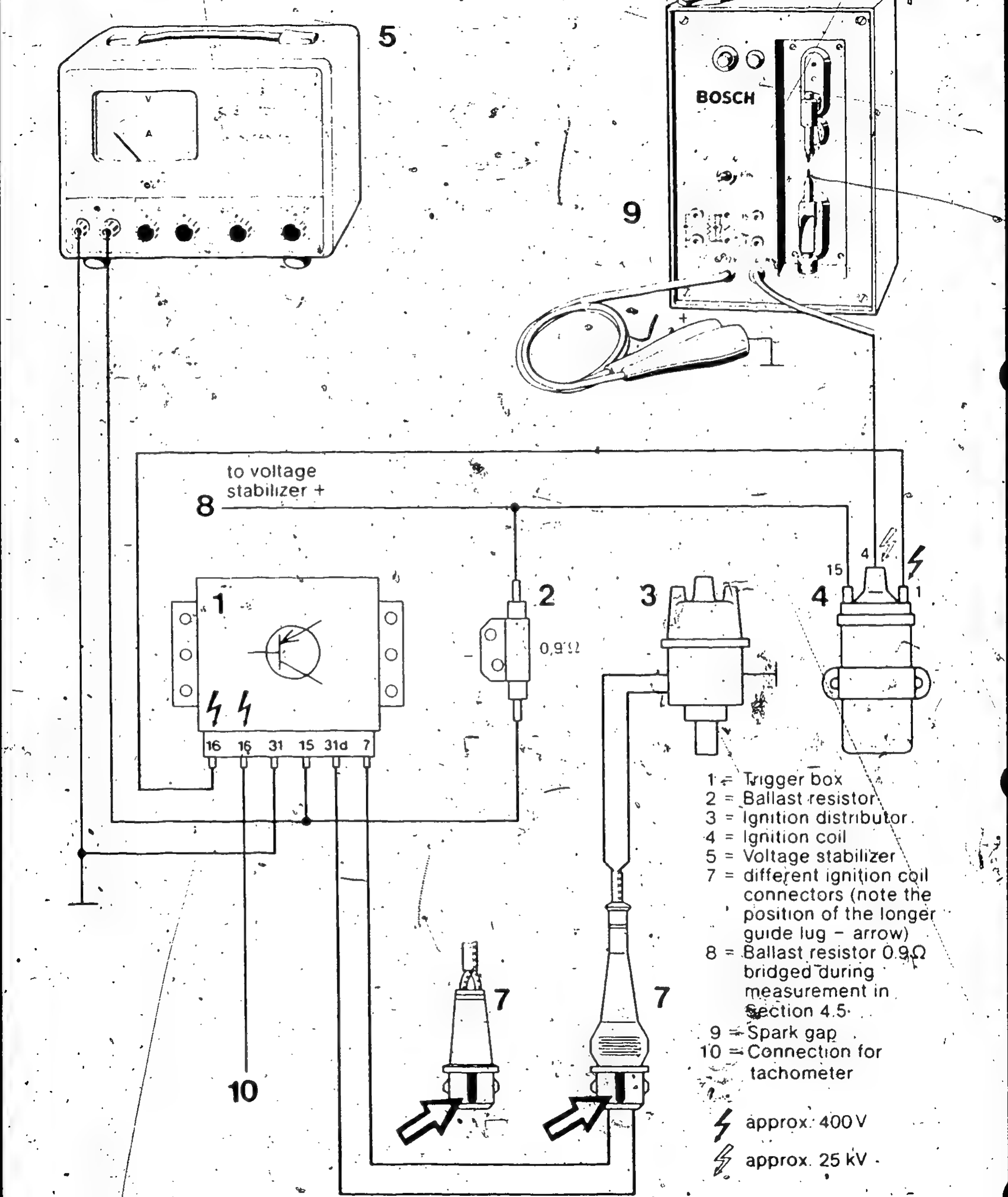
approx. 400 V

approx. 25 kV

4.2 Test the transistor output stage (Zener voltage)

Remove the voltage divider and connect the ignition distributor directly to the trigger box (Fig. 5)

Fig. 5 Connection diagram



1 = Trigger box
2 = Ballast resistor
3 = Ignition distributor
4 = Ignition coil
5 = Voltage stabilizer
7 = different ignition coil connectors (note the position of the longer guide lug – arrow)
8 = Ballast resistor 0.9Ω bridged during measurement in Section 4.5
9 = Spark gap
10 = Connection for tachometer

approx. 400 V

approx. 25 kV

F12

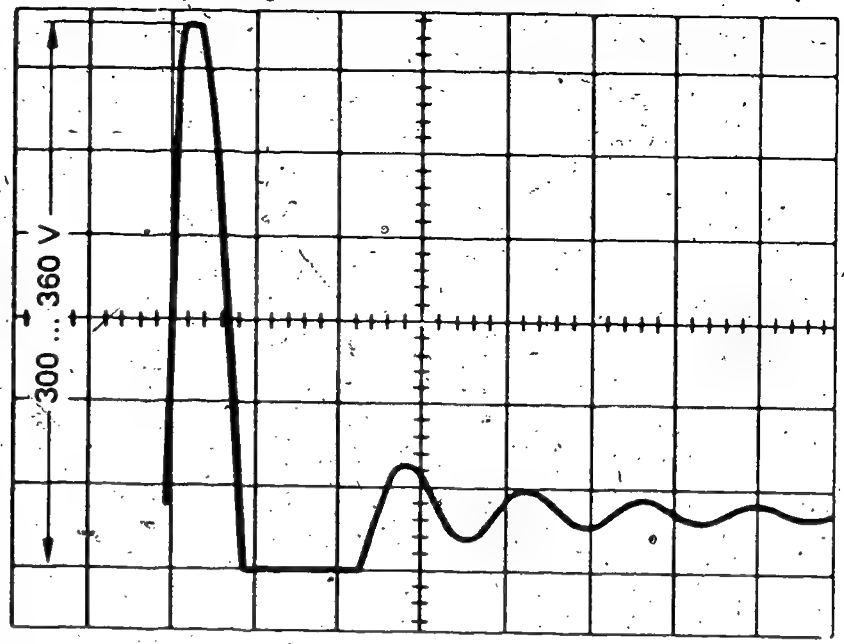


Figure 6 Transistor Output Stage Zener Voltage

Settings:
y = 5 V/major division
x = 50 µs/major division
300 ... 360 V

Drive the ignition distributor at a speed of 250 min^{-1}.
Connect the oscilloscope to the ignition coil (terminal 1) and ground with the 1:10 probe (important: balance probe).
Set spark gap to 8 mm.
Switch on voltage stabilizer and set to 14 V.
An ignition spark must be visible at the spark gap.
The oscillogram displayed must correspond to that shown in Fig. 6.
The important quantity is the magnitude of the voltage displayed.
This should be 300 ... 360 V. If this is not the case, the trigger box is defective. Switch off the voltage stabilizer and disconnect the oscilloscope.

F 13

4.3 Test the Transistor Output Stage ($V_{CE\ sat}$)

- Do not drive the ignition distributor.

Connect the voltmeter (measuring range 3 V) between the ignition coil (terminal 1) and ground. Switch on the voltage stabilizer and set to 14 V.

If the trigger box is not defective, the voltmeter should display 0.5 ... 2.0 V. If this is not the case, the trigger box is defective.

Switch off the voltage stabilizer and disconnect the voltmeter.

4.4 Dwell-angle Measurements

Connect the dwell-angle tester to the ignition coil in accordance with the operating instructions. Switch on the voltage stabilizer and set to 14 V.
Drive the ignition distributor at a speed of 750 ± 50 min^{-1}. The dwell angle should measure 52° ... 70°.
Drive the ignition distributor at a speed of 3500 ± 50 min^{-1}.
The dwell angle should measure 57° ... 76°.
If these specified values are not attained, the trigger box is defective.
Switch off the voltage stabilizer and disconnect the dwell-angle tester.

4.5 Operating Test at 6 Volts

Switch on the voltage stabilizer and set to 6 V. Switch off the stabilizer.
Bridge the ballast resistor as shown in connection diagram, Fig. 5, item 8.
Set the spark gap to 8 mm.
Drive the ignition distributor at a speed of 100 min^{-1}.
Switch on the voltage stabilizer.
Caution: With the ballast resistor bridged, the applied voltage should not exceed 10 V (trigger box is otherwise destroyed).
If the trigger box is not defective, sparks must be visible at the spark gap. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer. Disconnect the jumper from the 0.9 Ω ballast resistor (from the stabilizer).

F 15

4.6 Test Auxiliary Function (Tachometer connection, Term. 16)

Drive the ignition distributor at a speed of approx. 1000 min^{-1}.
Set the spark gap to 8 mm.
Connect the tachometer in accordance with the operating instructions and connection diagram, Fig. 5.
Switch on the voltage stabilizer and set to 14 V.
The tachometer must now show **twice** the ignition distributor speed.
If **no** value is displayed, the trigger box is defective.

F16

F-16

After-sales Service Instructions

Testing

22
VDT-W-227/312 En
Ed. 1

Breakerless Transistorized Ignition System (TCI-i)

with trigger box 0 227 100 025

BOSCH After-sales Service Automotive Equipment

F17

Contents

Caution!

High-energy ignition system.
Dangerous primary
and secondary voltages.

Please take note of our technical bulletin VDT-I-227/102 En

Automotive Equipment – After-sales Service
Department for Technical Publications KH/VDT
Postfach 50, D-7000 Stuttgart 1

Published by: After-sales Service
Department for Training and Technology (KH/VSK)
Please direct questions and comments concerning the contents to our authorized representative in your country.

Printed in the Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne
par Robert Bosch GmbH.
(12.1978)

F18

F 18

1. Testers and Auxiliary Materials Required

Voltage stabilizer ≧ 20 V/15 A	commercially available
Precision oscilloscope, e. g. Hameg 312 (with 1 : 1 and 1 : 10 probes)	commercially available
or	
Philips PM 3200 (with 1 : 1 and 1 : 10 probes)	commercially available
Ignition distributor test bench EFZV 10	0 680 123 001
Dwell-angle tester, e. g. MOT 002.00	0 684 000 200
Voltmeter (3 V scale), e. g. MOT 002.00	0 684 000 200
Spark gap (ignition coil and condenser tester EFAW 106 A)	0 681 100 001
or	
Single spark gap EF 1177/7	1 684 531 000
Complete ignition system consisting of:	
Trigger box (test specimen)	0 227 100 025
Ignition distributor (4 cyl. 600 Ω pulse generator)	0 237 300 001
Ignition coil (KW 12 V)	0 221 122 003
or	0 221 122 010
Ballast resistor (0.4/0.6 Ω)	0 227 900 101
Connecting parts (for the trigger box)	2 227 000 101
Approx. 1.5 m cable, 1.5 mm² e. g.	6 210 150 150
2 Ignition-coil cable terminals dia. 5 mm	1 901 353 126
2 blade receptacles for ballast resistor	1 901 355 881
1 potentiometer 20 kΩ, ⅓ W (linear)	commercially available
1 resistor 620 Ω, ⅓ W ± 5 %	commercially available

F 19

F19

2. Workshop Instructions

- Specified parts of the complete ignition system, including the connecting parts set, should always be used to avoid **destruction** and **incorrect measurement.**
- The measurements must be made at room temperature.
- It is important that the measurements be made at the respective voltage specified.
- The ignition distributor specified for the test must be checked at regular intervals in accordance with the prescribed ignition distributor test instructions.
- The spark gap must be connected and **set to 8 mm** for the entire measuring procedure. The spark gap must be in perfect condition.

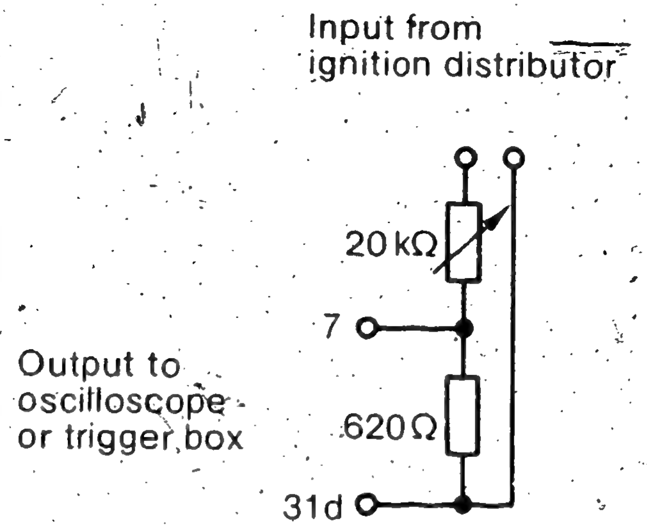


Figure 1 Voltage divider

3. Preparations for Testing

3.1 Making Your Own Voltage Divider

The following parts are needed:

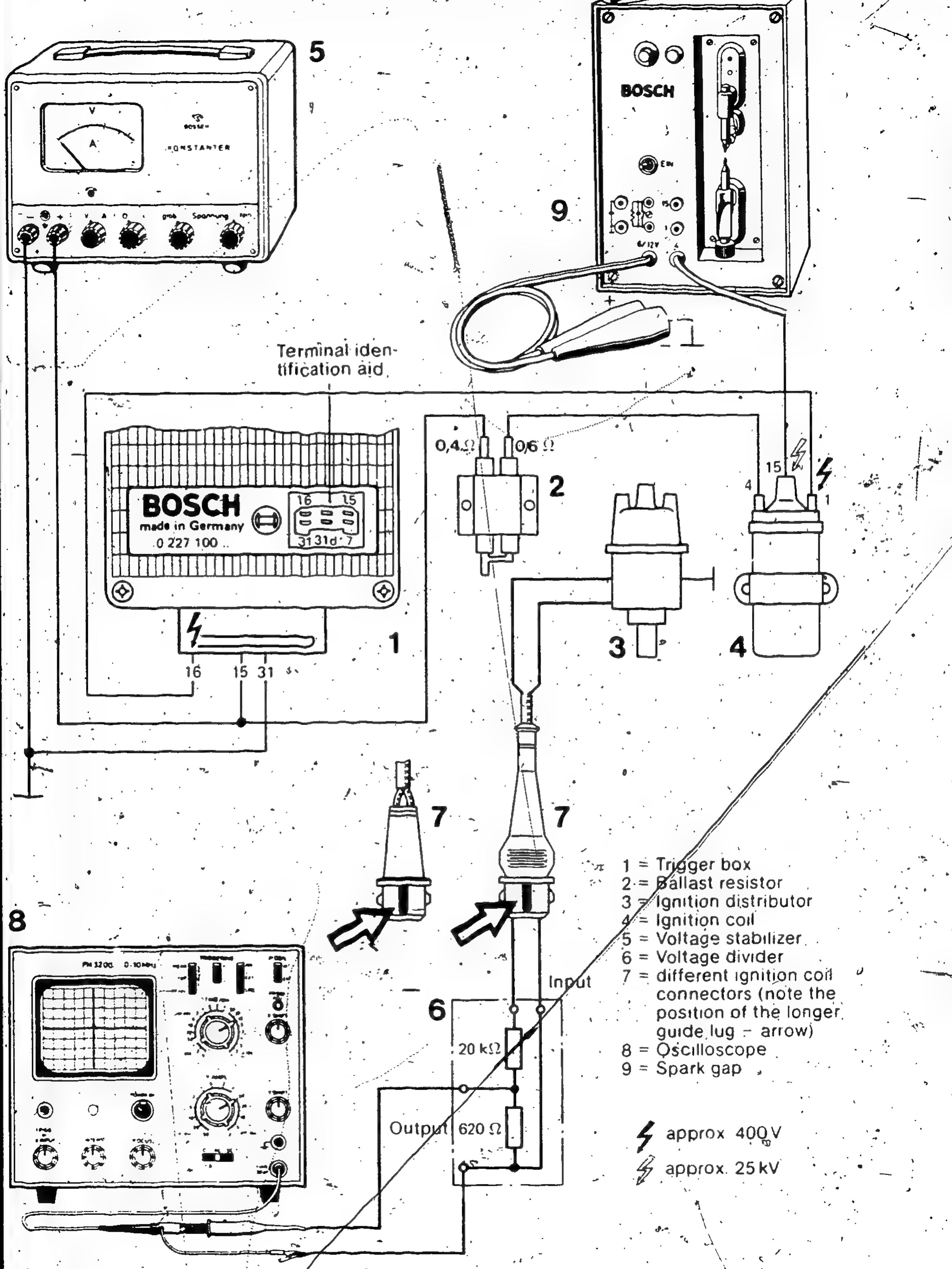
1 potentiometer 20 kΩ, 1/3 W (linear)
1 resistor 620 Ω, 1/3 W ±5%

Connect parts electrically, see Fig. 1.

Note: To simplify testing, the voltage divider can be permanently mounted on a board and equipped with connector bushings.

F 21

Fig. 2 Connection diagram



1 = Trigger box
2 = Ballast resistor
3 = Ignition distributor
4 = Ignition coil
5 = Voltage stabilizer
6 = Voltage divider
7 = different ignition coil connectors (note the position of the longer guide lug – arrow)
8 = Oscilloscope
9 = Spark gap

approx. 400 V

approx. 25 kV

3.2 Set Up Complete Ignition System

Switch on the voltage stabilizer and set to 14 V.
Switch off stabilizer.
Set up ignition system, testers, including the voltage divider, (see section 1 for parts) and connect electrically in accordance with the connection diagram, Fig. 2.
Connect the spark gap: **black clip to negative;** do not connect red clip. Connect high-tension cable (terminal 4) to the ignition coil (terminal 4).

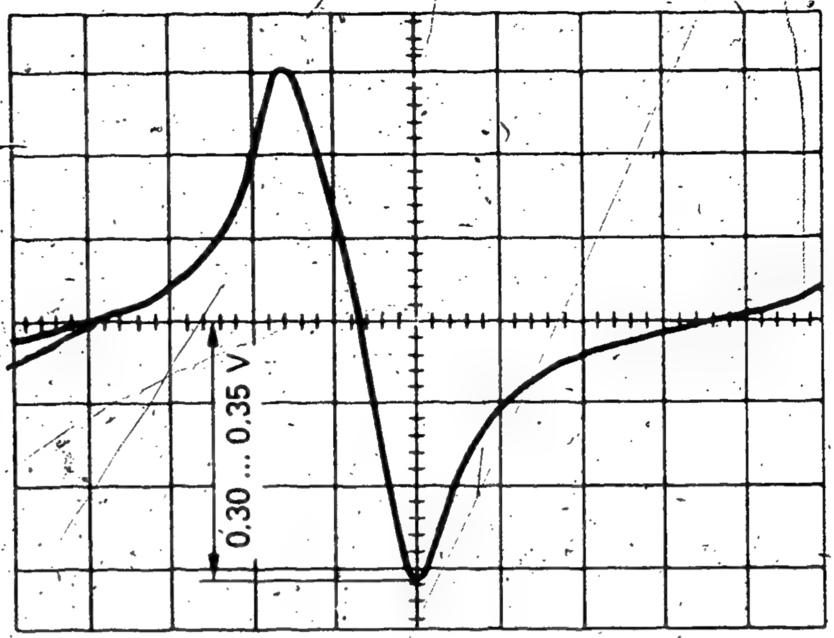


Figure 3 Threshold Voltage

Settings:
y = 0.1 V/major division
x = 5 ms/major division
0.30 ... 0.35 V

3.3 Set the Threshold Voltage

Using the appropriate flange, clamp the ignition distributor into the EFZV 10 ignition distributor test bench and drive at a speed of 250 min^{-1}.
Connect the ignition distributor to the voltage divider input (Fig. 2). Connect the oscilloscope with the 1 : 1 probe to the (user-fabricated) voltage divider output, and turn the potentiometer of the voltage divider until the oscilloscope reads 0.30 ... 0.35 V, the **negative** half-wave being measured; see Fig. 3.

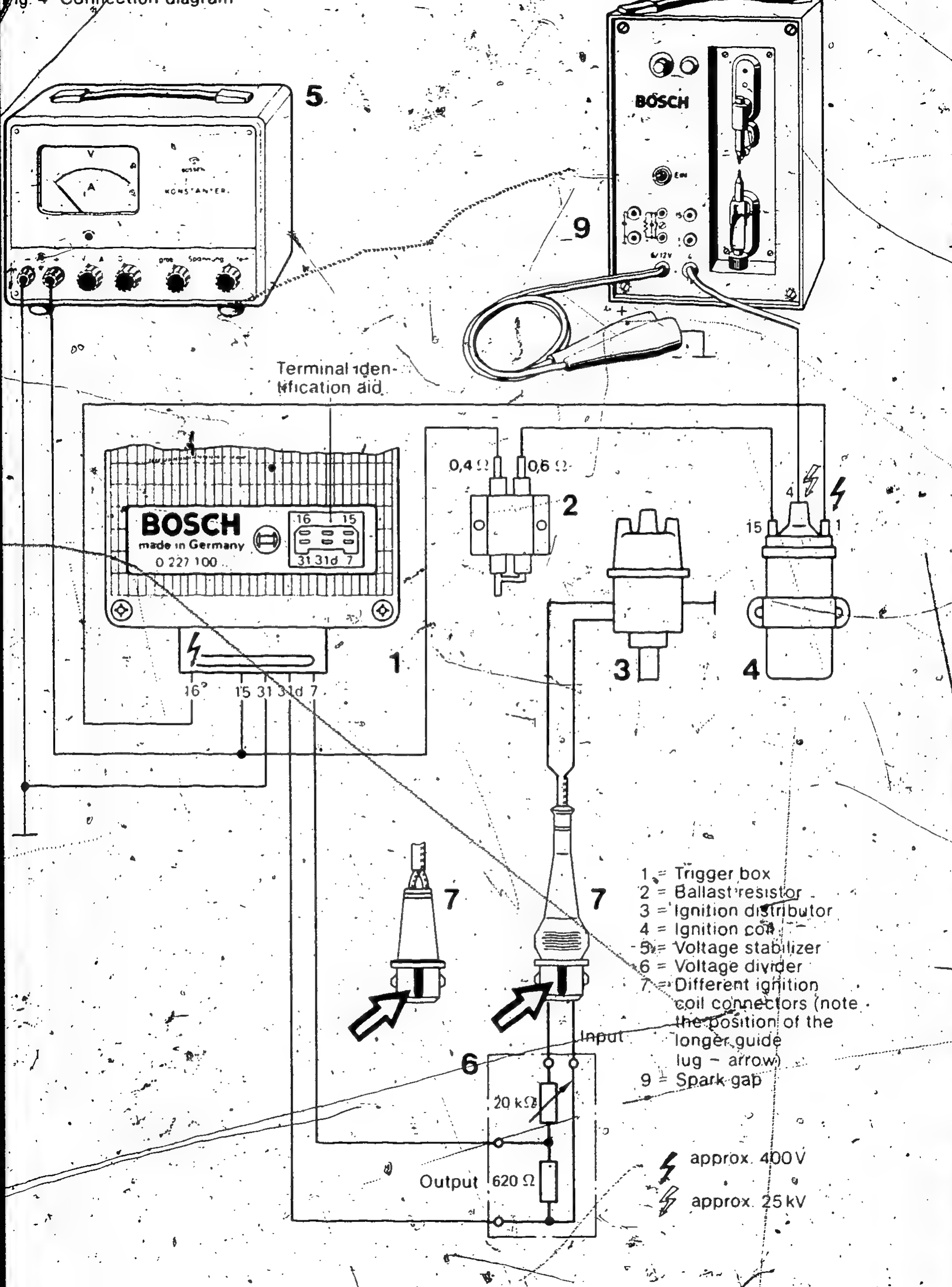
Note: The speed of the ignition distributor test bench must be continually checked and corrected as needed during the following measurement.

4. Testing

4.1 Test the Input Stage

Disconnect the oscilloscope from the voltage divider output.
Connect the output to the trigger box (do not mix up terminals), Fig. 4.
Set the spark gap to 8 mm.
Switch on the voltage stabilizer and set to 14 V.
The ignition spark must now be visible at the spark gap.
If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer.

Fig. 4 Connection diagram



1 = Trigger box
2 = Ballast resistor
3 = Ignition distributor
4 = Ignition coil
5 = Voltage stabilizer
6 = Voltage divider
7 = Different ignition coil connectors (note the position of the longer guide lug – arrow)
9 = Spark gap

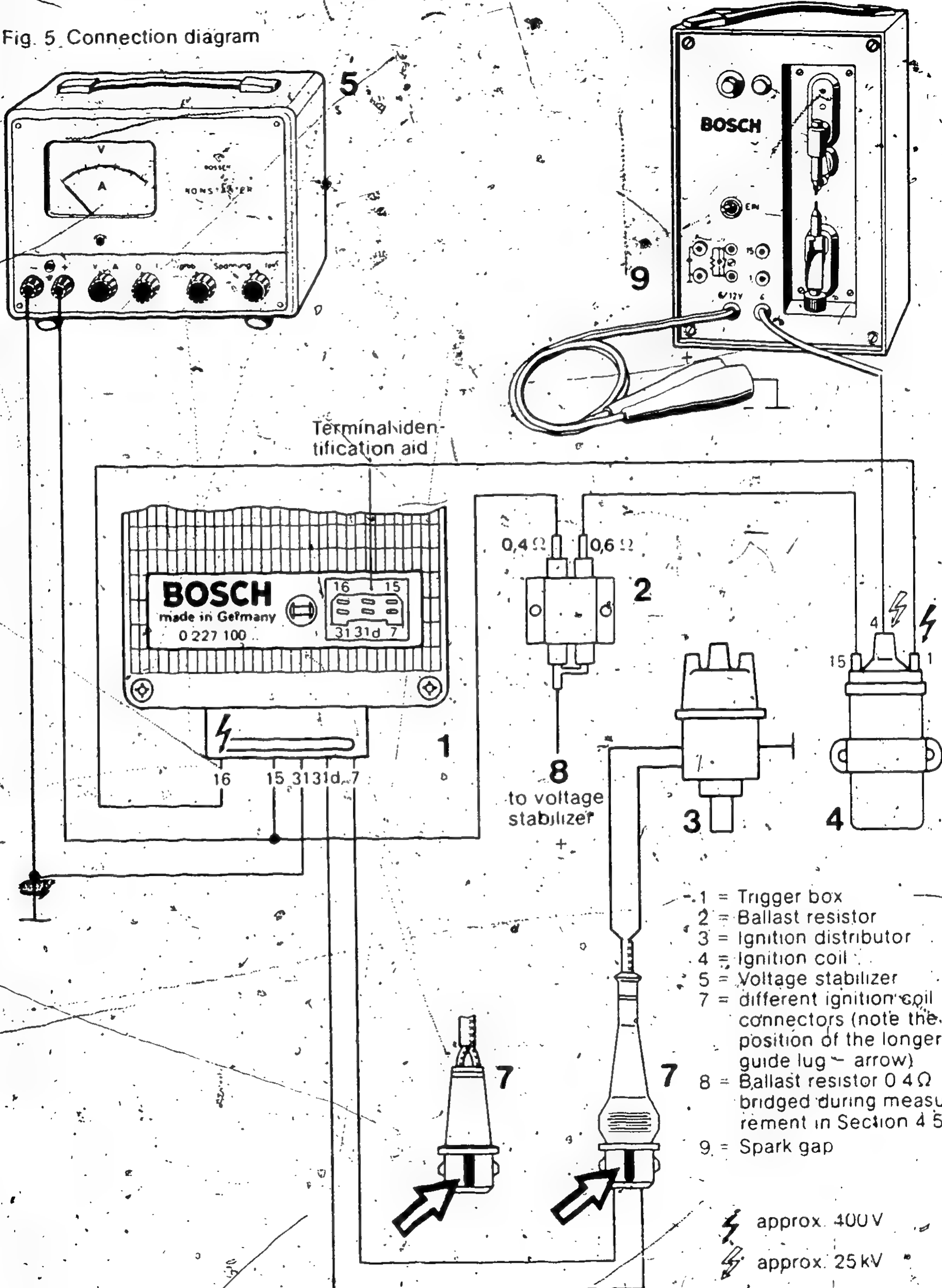
approx. 400 V

approx. 25 kV

4.2 Test the transistor output stage (Zener voltage)

Remove the voltage divider and connect the ignition distributor directly to the trigger box (Fig. 5).

Fig. 5 Connection diagram



1 = Trigger box
2 = Ballast resistor
3 = Ignition distributor
4 = Ignition coil
5 = Voltage stabilizer
7 = different ignition coil connectors (note the position of the longer guide lug – arrow)
8 = Ballast resistor 0 4 Ω bridged during measurement in Section 4 5
9 = Spark gap

approx. 400 V

approx. 25 kV

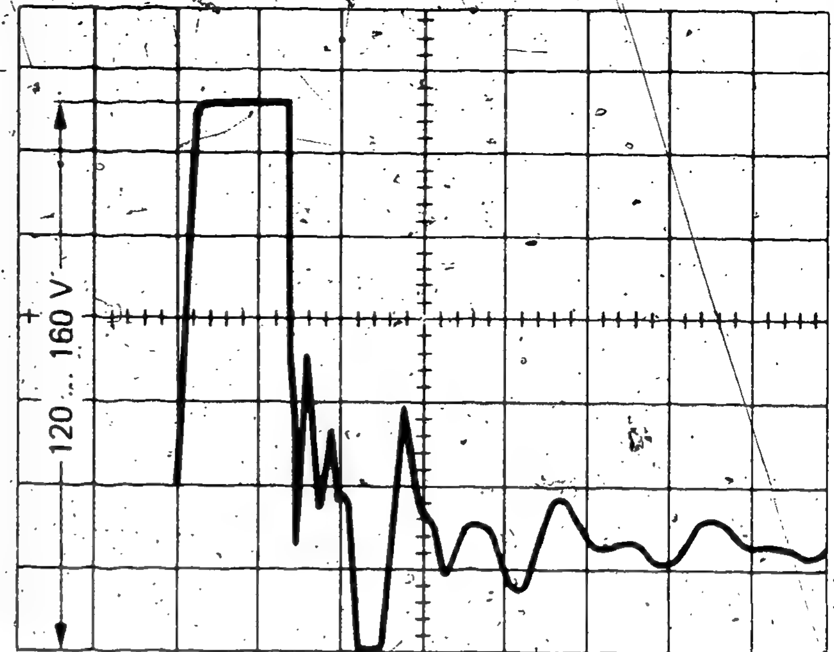


Figure 6 Transistor Output Stage Zener Voltage

Settings:
y = 2 V/major division
x = 20 µs/major division
120 ... 160 V

Drive the ignition distributor at a speed of 250 min^{-1}.
Connect the oscilloscope to the ignition coil (terminal 1) and ground with the 1:10 probe (important: balance probe).
Set spark gap to 8 mm.
Switch on voltage stabilizer and set to 14 V.
An ignition spark must be visible at the spark gap.
The oscillogram displayed must correspond to that shown in Fig. 6.
The important quantity is the magnitude of the voltage displayed. This should be 120 ... 160 V. If this is not the case, the trigger box is defective. Switch off the voltage stabilizer and disconnect the oscilloscope.

4.3 Test the Transistor Output Stage ($V_{CE\ sat}$)

Do not drive the ignition distributor.
Connect the voltmeter (measuring range 3 V) between the ignition coil (terminal 1) and ground. Switch on the voltage stabilizer and set to 14 V.
If the trigger box is not defective, the voltmeter should display 0.5 ... 2.0 V. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer and disconnect the voltmeter.

G1

G1

4.4 Dwell-angle Measurements

Connect the dwell-angle tester to the ignition coil in accordance with the operating instructions. Switch on the voltage stabilizer and set to 14 V.
Drive the ignition distributor at a speed of $750 \pm 50\,min^{-1}$. The dwell angle should measure 33° ... 51°.
Drive the ignition distributor at a speed of $3500 \pm 50\,min^{-1}$.
The dwell angle should measure 43° ... 53°.
If these specified values are not attained, the trigger box is defective.
Switch off the voltage stabilizer and disconnect the dwell-angle tester.

4.5 Operating Test at 6 Volts

Switch on the voltage stabilizer and set to 6 V. Switch off the stabilizer.
Bridge the ballast resistor as shown in connection diagram, Fig. 5, item 8.
Set the spark gap to 8 mm.
Drive the ignition distributor at a speed of $100\,min^{-1}$.
Switch on the voltage stabilizer.
Caution: With the ballast resistor bridged, the applied voltage should not exceed 10 V (trigger box is otherwise destroyed).
If the trigger box is not defective, sparks must be visible at the spark gap. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer. Disconnect the jumper from the 0.4 Ω ballast resistor (from the stabilizer).

G 2

After-sales Service Instructions

Testing

22

VDT-W-227/313 En

Ed. 1

Breakerless Transistorized Ignition System (TCI-i)

with trigger box 0 227 100 029

BOSCH After-sales Service
Automotive
Equipment

G3

Contents

Caution!

High-energy ignition system.
Dangerous primary
and secondary voltages.

Please take note of our technical bulletin VDT-I-227/102 En

Automotive Equipment – After-sales Service
Department for Technical Publications KH/VDT
Postfach 50, D-7000 Stuttgart 1

Published by: After-sales Service
Department for Training and Technology (KH/VSK)

Please direct questions and comments concerning the contents to our authorized representative in your country.

Printed in the Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne
par Robert Bosch GmbH.
(12.1978)

G4

1. Testers and Auxiliary Materials Required

Voltage stabilizer ≧ 20 V/15 A	commercially available
Precision oscilloscope, e. g. Hameg 312 (with 1 : 1 and 1 : 10 probes)	commercially available
or	
Philips PM 3200 (with 1 : 1 and 1 : 10 probes)	commercially available
Ignition distributor test bench EFZV 10	0 680 123 001
Dwell-angle tester, e. g. MOT 002.00	0 684 000 200
Voltmeter (3 V scale), e. g. MOT 002.00	0 684 000 200
Spark gap (ignition coil and condenser tester EFAW 106 A)	0 681 100 001
or	
Single spark gap EF 1177/7	1 684 531 000
Complete ignition system consisting of: Trigger box (test specimen)	0 227 100 029
Ignition distributor (4 cyl. 1.1 kΩ pulse generator)	0 237 001 001
or	0 237 002 001
or	0 237 002 002
Ignition coil (KW 12 V)	0 221 122 012
Ballast resistor (0.9 Ω)	0 227 900 002
Connecting parts (for the trigger box)	2 227 000 101
Approx. 1.5 m cable, 1,5 mm² e. g.	6 210 150 150
1 ignition-coil cable terminal dia. 5 mm	1 901 353 126
2 blade receptacles for ballast resistor	1 901 355 881
1 potentiometer 20 kΩ, 1/3 W (linear)	commercially available
1 resistor 1.2 kΩ, 1/3 W ± 5 %	commercially available

2. Workshop Instructions

- Specified parts of the complete ignition system, including the connecting parts set, should always be used to avoid **destruction** and **incorrect measurement.**
- The measurements must be made at room temperature.
- It is important that the measurements be made at the respective voltage specified.
- The ignition distributor specified for the test must be checked at regular intervals in accordance with the prescribed ignition distributor test instructions.
- The spark gap must be connected and **set to 8 mm** for the entire measuring procedure. The spark gap must be in perfect condition.

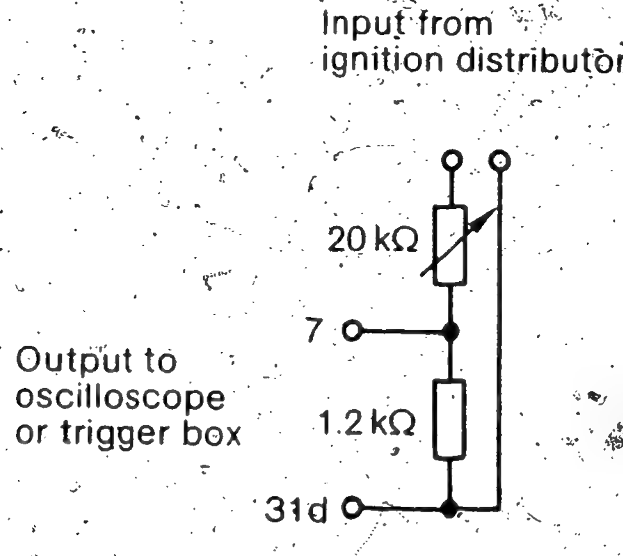


Figure 1 Voltage divider

3. Preparations for Testing

3.1 Making Your Own Voltage Divider

The following parts are needed:

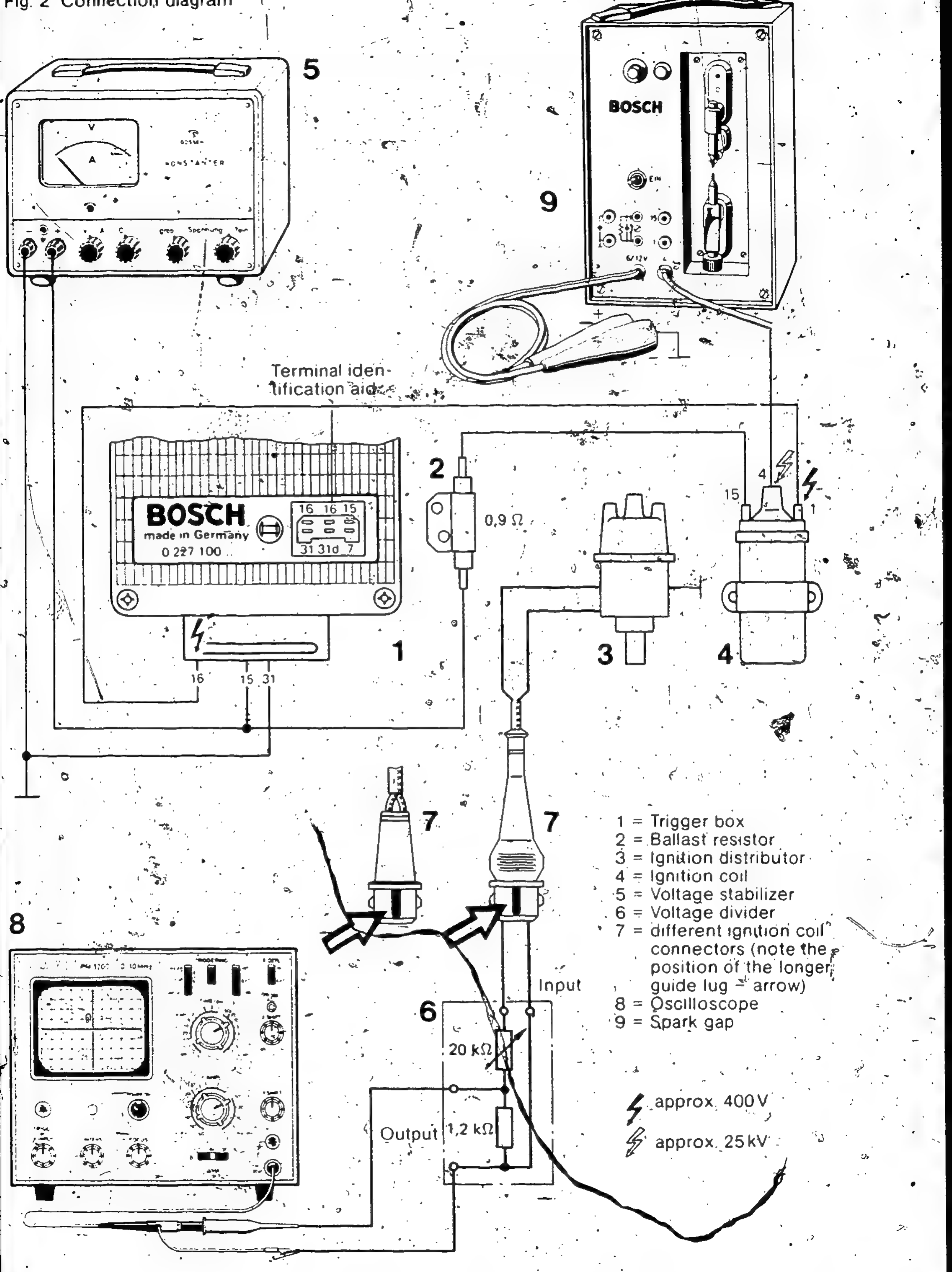
1 potentiometer 20 kΩ, 1/3 W (linear)
1 resistor 1.2 kΩ, 1/3 W ±5%

Connect parts electrically, see Fig. 1.

Note: To simplify testing, the voltage divider can be permanently mounted on a board and equipped with connector bushings.

W -227 1373

Fig. 2 Connection diagram



1 = Trigger box
2 = Ballast resistor
3 = Ignition distributor
4 = Ignition coil
5 = Voltage stabilizer
6 = Voltage divider
7 = different ignition coil connectors (note the position of the longer guide lug – arrow)
8 = Oscilloscope
9 = Spark gap

approx. 400 V

approx. 25 kV

3.2 Set Up Complete Ignition System

Switch on the voltage stabilizer and set to 14 V.
Switch off stabilizer.
Set up ignition system, testers, including the voltage divider, (see section 1 for parts) and connect electrically in accordance with the connection diagram, Fig. 2.
Connect the spark gap: **black clip to negative;** do not connect red clip. Connect high-tension cable (terminal 4) to the ignition coil (terminal 4).

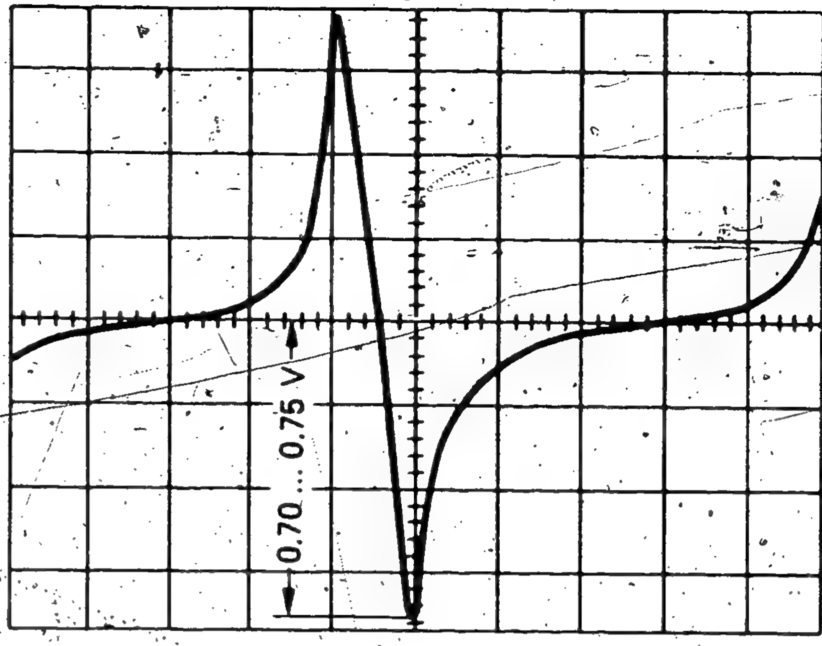


Figure 3 Threshold Voltage

Settings:
y = 0.2 V/major division
x = 10 ms/major division
0.70 ... 0.75 V

3.3 Set the Threshold Voltage

Using the appropriate flange, clamp the ignition distributor into the EFZV 10 ignition distributor test bench and drive at a speed of 250 min^{-1}.
Connect the ignition distributor to the voltage divider input (Fig. 2).
Connect the oscilloscope with the 1 : 1 probe to the (user-fabricated) voltage divider output, and turn the potentiometer of the voltage divider until the oscilloscope reads 0.70 ... 0.75 V, the **negative** half-wave being measured; see Fig. 3.

Note: The speed of the ignition distributor test bench must be continually checked and corrected as needed during the following measurement.

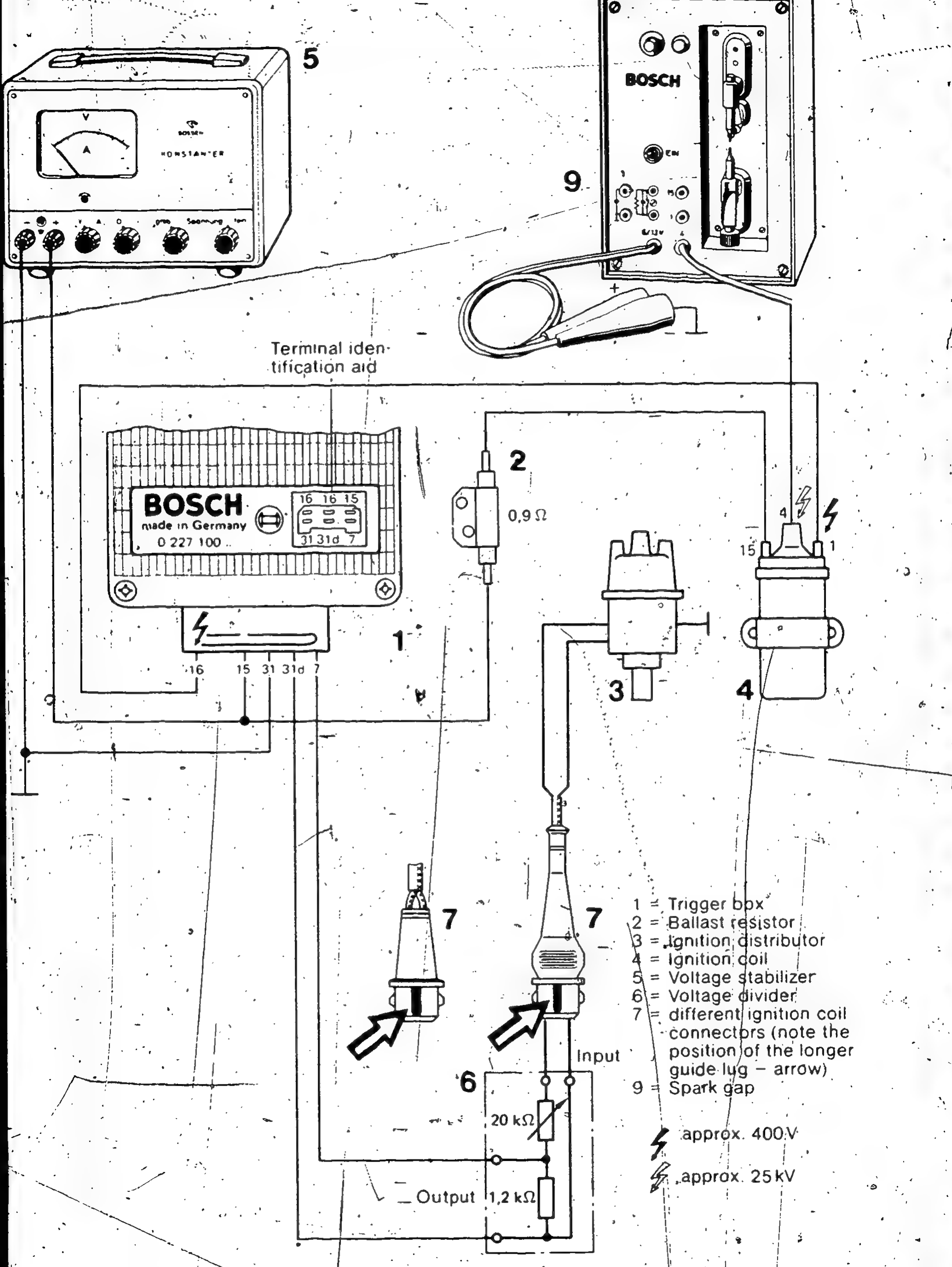
4. Testing

4.1 Test the Input Stage

Disconnect the oscilloscope from the voltage divider output.
Connect the output to the trigger box (do not mix up terminals), Fig. 4.
Set the spark gap to 8 mm.
Switch on the voltage stabilizer and set to 14 V.
The ignition spark must now be visible at the spark gap. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer.

W-2271313

Fig. 4 Connection diagram



1 = Trigger box
2 = Ballast resistor
3 = Ignition distributor
4 = Ignition coil
5 = Voltage stabilizer
6 = Voltage divider
7 = different ignition coil connectors (note the position of the longer guide lug – arrow)
9 = Spark gap

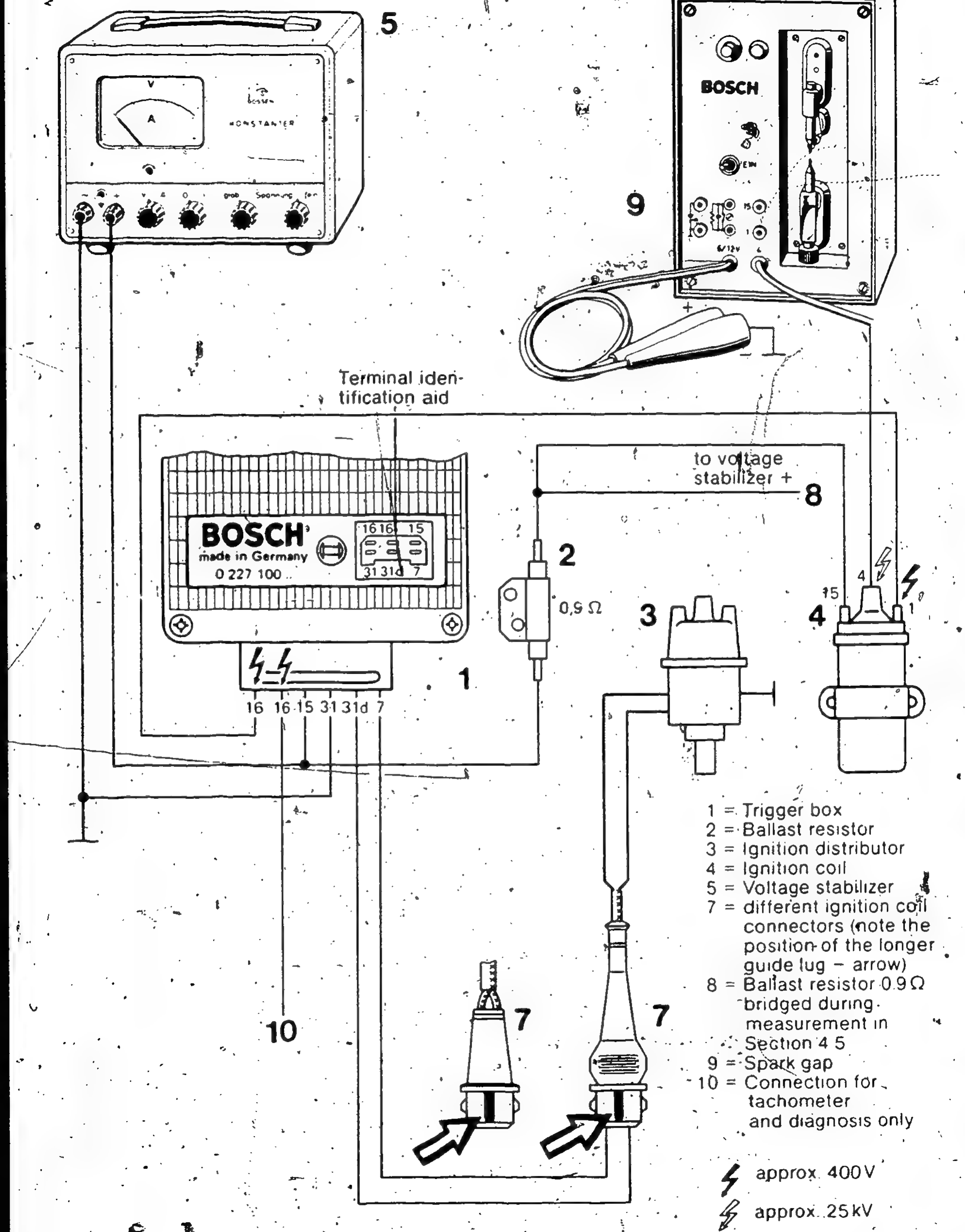
approx. 400 V

approx. 25 kV

4.2 Test the transistor output stage (Zener voltage)

Remove the voltage divider and connect the ignition distributor directly to the trigger box (Fig. 5)

Fig. 5 Connection diagram



1 = Trigger box
2 = Ballast resistor
3 = Ignition distributor
4 = Ignition coil
5 = Voltage stabilizer
7 = different ignition coil connectors (note the position of the longer guide lug – arrow)
8 = Ballast resistor 0.9 Ω bridged during measurement in Section 4 5
9 = Spark gap
10 = Connection for tachometer and diagnosis only

approx. 400 V

approx. 25 kV

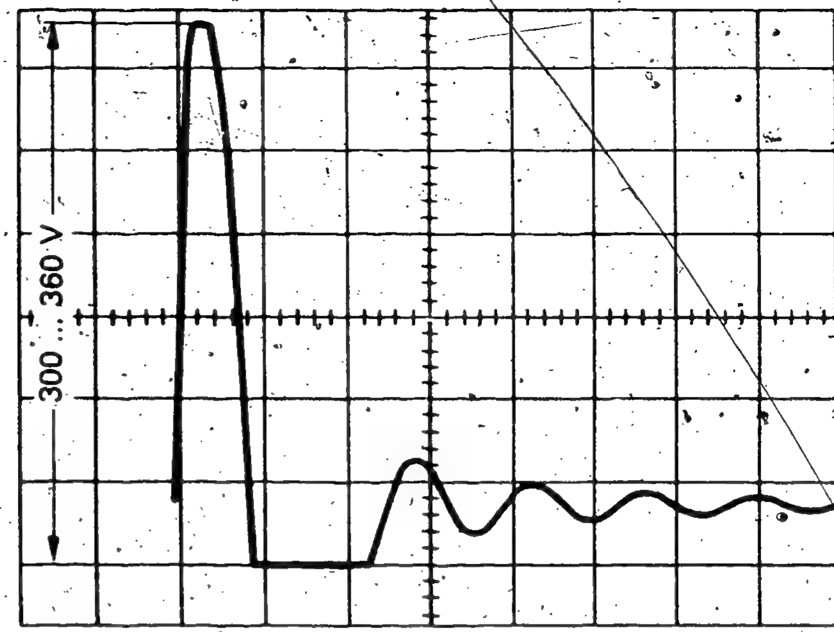


Figure 6 Transistor Output Stage Zener Voltage

Settings:
y = 5 V/major division
x = 50 µs/major division
300 ... 360 V

Drive the ignition distributor at a speed of 250 min^{-1}.
Connect the oscilloscope to the ignition coil (terminal 1) and ground with the 1:10 probe (important: balance probe).
Set spark gap to 8 mm.
Switch on voltage stabilizer and set to 14 V.
An ignition spark must be visible at the spark gap.
The oscillogram displayed must correspond to that shown in Fig. 6.
The important quantity is the magnitude of the voltage displayed.
This should be 300 ... 360 V. If this is not the case, the trigger box is defective. Switch off the voltage stabilizer and disconnect the oscilloscope.

4.3 Test the Transistor Output Stage ($V_{CE\ sat}$)

Do not drive the ignition distributor.
Connect the voltmeter (measuring range 3 V) between the ignition coil (terminal 1) and ground. Switch on the voltage stabilizer and set to 14 V.
If the trigger box is not defective, the voltmeter should display 0.5 ... 2.0 V. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer and disconnect the voltmeter.

G 15

W - 2271313

4.4 Dwell-angle Measurements

Connect the dwell-angle tester to the ignition coil in accordance with the operating instructions. Switch on the voltage stabilizer and set to 14 V.
Drive the ignition distributor at a speed of 750 ± 50 min^{-1}. The dwell angle should measure 52° ... 70°.
Drive the ignition distributor at a speed of 3500 ± 50 min^{-1}.
The dwell angle should measure 57° ... 76°.
If these specified values are not attained, the trigger box is defective.
Switch off the voltage stabilizer and disconnect the dwell-angle tester.

4.5 Operating Test at 6 Volts

Switch on the voltage stabilizer and set to 6 V. Switch off the stabilizer.
Bridge the ballast resistor as shown in connection diagram, Fig. 5, item 8.
Set the spark gap to 8 mm.
Drive the ignition distributor at a speed of 100 min^{-1}.
Switch on the voltage stabilizer.
Caution: With the ballast resistor bridged, the applied voltage should not exceed 10 V (trigger box is otherwise destroyed).
If the trigger box is not defective, sparks must be visible at the spark gap. If this is not the case, the trigger box is defective.
Switch off the voltage stabilizer. Disconnect the jumper from the 0.9 Ω ballast resistor (from the stabilizer).

4.6 Test Auxiliary Function (Tachometer and Diagnostic Connection, Term. 16)

Drive the ignition distributor at a speed of approx. 1000 min^{-1}.
Set the spark gap to 8 mm.
Connect the tachometer in accordance with the operating instructions and connection diagram, Fig. 5.
Switch on the voltage stabilizer and set to 14 V.
The tachometer must now show **twice** the ignition distributor speed.
If **no** value is displayed, the trigger box is defective.

0.17

G17

Kundendienst-Anleitung

Test Instructions

22

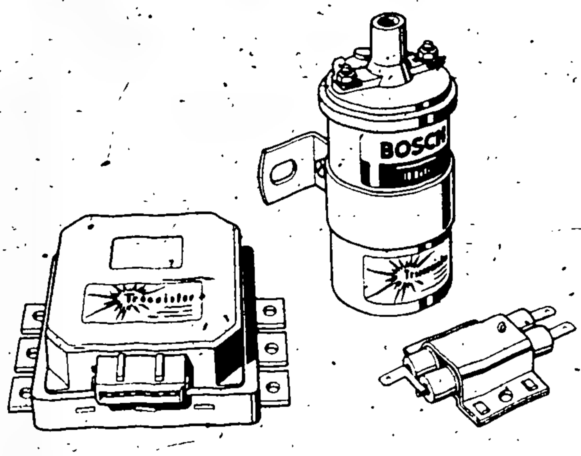
VDT-WPE 125/104 B
<VDT-W-227/300 B>
Ed. 1

Inductive Semiconductor Ignition

TCI-System, 12 V, with Trigger Box 0 227 051 021

BOSCH Geschäftsbereich KH
Kundendienst

G18



1. Test Equipment

Voltmeter	e.g.	EFAW 120 A	0 681 100 201
Ignition coil test instrument		EFMZ 1 A	0 681 120 001
Ohmmeter	e.g.	Pontavi	Commercially available

2. Instructions for Working on the TCI in the Workshop

The ignition coil for inductive semiconductor ignition systems must not be replaced by a conventional ignition ~~coil or co~~nnected as such.

Non-observance of the following points will result in the destruction of the trigger box.

When connecting the battery observe the correct polarity (negative terminal to ground).

Do not interchange the leads connected to the trigger box.

Published by Robert Bosch GmbH
Automotive Equipment Division, After-sales Service,
Department for Technical Publications KH/VDT
D-7 Stuttgart 1, Postfach 50

Please address any queries or comments concerning the contents of this publication to our representative in your country.

3. Testing the Trigger Box

3.1 Assembly of the TCI-System

Completely assemble the system and connect electrically (Fig. 1).

So that no internal voltage flashovers occur in the ignition coil (insulation damage), the secondary side should be connected to ground during measurements (Fig. 1).

In order to avoid contact resistances and short-circuits, the trigger box must be connected with the original plug, Part No. 1 227 000 028. Further, to ensure reliable measurements the battery voltage must be 11 to 13 V.

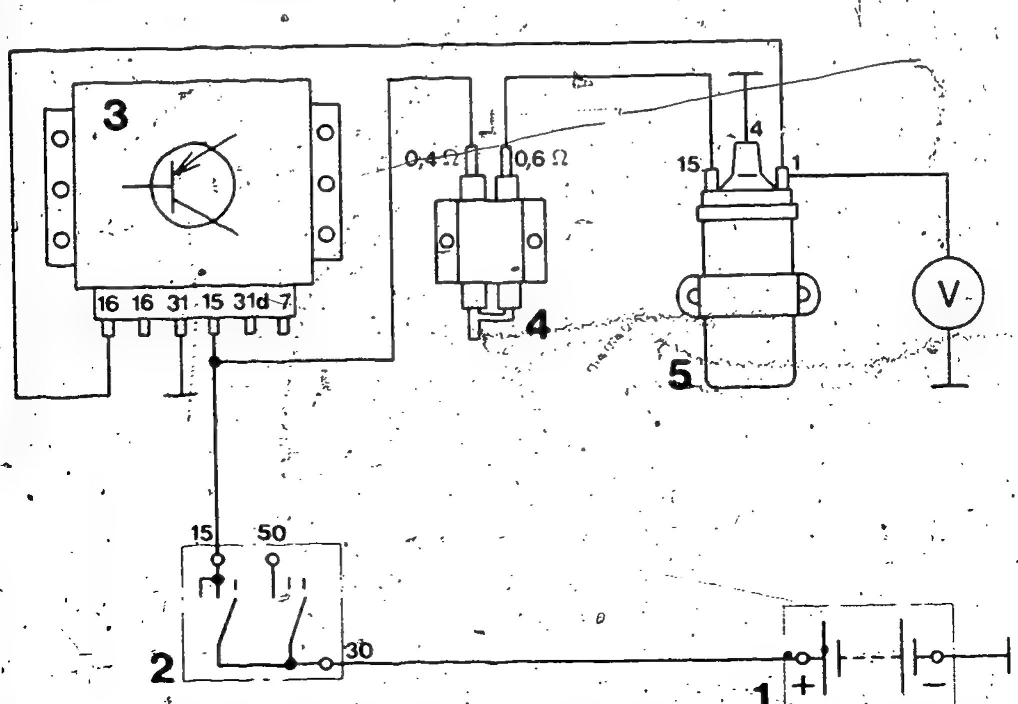
3.2 Voltage Readings when Transistors not Conducting
(testing blocking performance of transistors)

Connect voltmeter (effective range 12 V) according to Fig. 1.

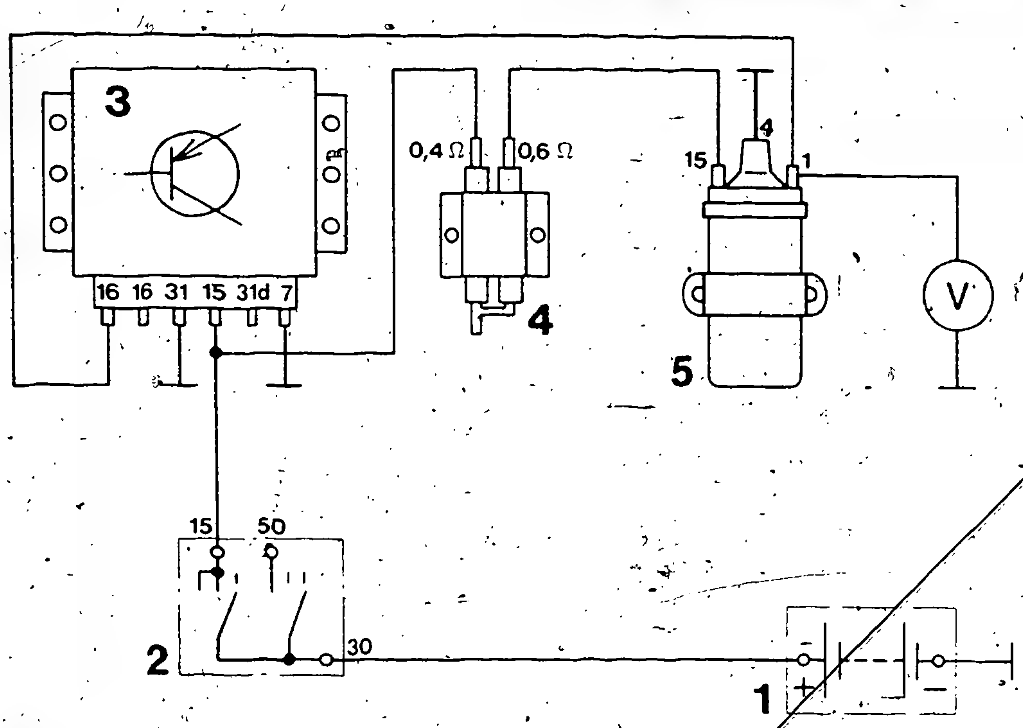
Do not connect terminal 7 of the trigger box. Switch on power supply.

The voltmeter must indicate the battery voltage. If not, replace the trigger box.

Fig. 1
1 = Battery
2 = Ignition starting switch
3 = Trigger box 0 227 051 021
4 = ~~Resistor 0 227 000 101~~
5 = Ignition coil 0 221 122 005



Seite 4



3.3 Voltage Readings when Transistors Conducting

Connect voltmeter (effective range 3 V) as shown in Fig. 2.

Connect terminal 7 of the trigger box **to ground.** Switch on the power supply **briefly.**

The voltmeter is permitted to indicate a maximum voltage of 1.5 V. If exceeded, renew the trigger box.

Fig. 2
1 = Battery
2 = Ignition starting switch
3 = Trigger box 0 227 051 021
4 = Resistor 0 227 900 101
5 = Ignition coil 0 221 122 005

4. Testing the Ignition Coil

(connecting cables removed)

Instrument: Commercially-available ohmmeter with effective range from 0.1 Ω (e.g. Pontavi).

Primary resistance measured between terminals 1 and 15	1.2–1.6 Ω
Secondary resistance measured between terminals 1 and 4	7–12 kΩ

Ground short-circuit and power output tests to be performed using EFMZ 1 A.

5. Testing the Series Resistor

Instrument: Commercially-available ohmmeter with effective range from 0.1 Ω (e.g. Pontavi).

Resistor, 0.4 Ω	0.35–0.45 Ω
Resistor, 0.6 Ω	0.55–0.65 Ω

Robert Bosch GmbH (3.75)
D-7 Stuttgart 1, Postfach 50. Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

After-sales Service Instructions

Testing

33

VDT-W-335/303 En
Ed. 1

Electronic Battery Tester
0 335 550 201

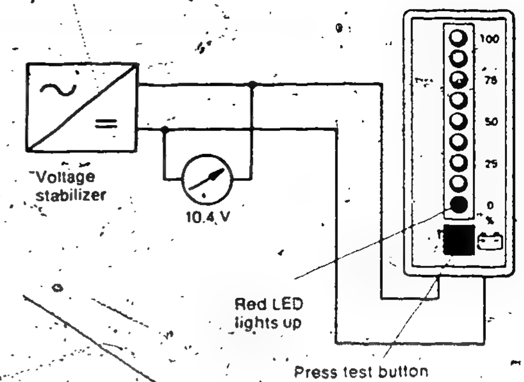
BOSCH After-sales Service
Automotive
Equipment

G22

1. Test equipment

1.1 Voltage stabilizer, commercially available

1.2 Digital Multimeter, commercially available



1

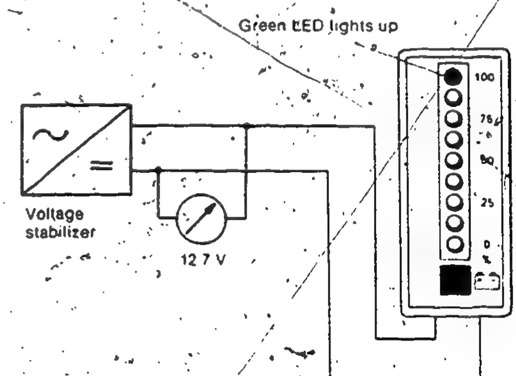
2. Test sequence

2.1 Set the voltage supply to 10.4 V.

2.2 The two leads are to be connected to a voltage stabilizer.

In order to test, the test button is to be pressed. If there is no indication, it is possible that + or – connections to the tester are connected to the wrong polarity.

If the polarity of the connections is correct, then the tester is defective and must be replaced.



2

2.3 Set the voltage supply to 12.7 V. Press the test button.

Only the green LED (100 %) is to light up.

2.4 When the voltage from the voltage stabilizer is changed, the LEDs should light up accordingly. That is: with a change from 13 ... 10 V the 100 % to 0 % LEDs should light up in that order and one after another. Similarly, with a change from 10 ... 13 V the 0 % to 100 % LEDs should light up in that order and one after another. At no time may more than two LEDs light up simultaneously (if two do light up together, then there is a reduction in brightness).

2.5 If the above test results are not obtained, then the tester is defective and must be replaced.

Automotive Equipment – After-sales Service
Department for Technical Publications KH/VDT
Postfach 50, D-7000 Stuttgart 1

Published by: After-sales Service
Department for Training and Technology (KH/VSK)
Please direct questions and comments concerning the contents to our authorized representative in your country.

Printed in the Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.
(2.79)

[illegible]er-sales [illegible] ions

Parts Set [illegible] (12 V)
Parts Set [illegible] (24 V)

G24

Components:

1 contact breaker
1 capacitor
1 adjusting screw
7 fastening screws with nuts and spring lock washers for contact breaker and assembly
6 seals for diaphragm

Solenoid windings should be ordered separately:

For Horn	Solenoid winding
0 320 223 002	1 324 101 075
0 320 223 003	1 324 101 075
0 320 223 008	1 324 101 075
0 320 223 009	1 324 101 075
0 320 223 017	1 324 101 063
0 320 223 022	1 324 101 063
0 320 223 028	1 324 101 063
0 320 223 018	1 324 101 064
0 320 223 023	1 324 101 064
0 320 223 029	1 324 101 064
0 320 226 002	1 324 101 074
0 320 226 003	1 324 101 074
0 320 226 008	1 324 101 074
0 320 226 009	1 324 101 074
0 320 226 017	1 324 101 074
0 320 226 018	1 324 101 074

Horns with a defective diaphragm can not be repaired. The horns listed above are riveted 125 mm dia. models. Horns not listed can not be repaired.

Working steps

1. Open the horn. Drill out the rivets. Before drilling these rivets out, center-punch them in the center because if they are drilled out off-center the diaphragm clamping collar will be damaged. Use a drill bit with a diameter of 4 mm.
Keep the old seals between the diaphragm and the housing and use them again if they have not been damaged. Remove the contact breaker. In order to do this, drill out the rivet using a drill bit with a diameter of 4 mm. Blow out the horn with compressed air. If necessary, replace the solenoid winding. Mark the adhesive spots for the cables.

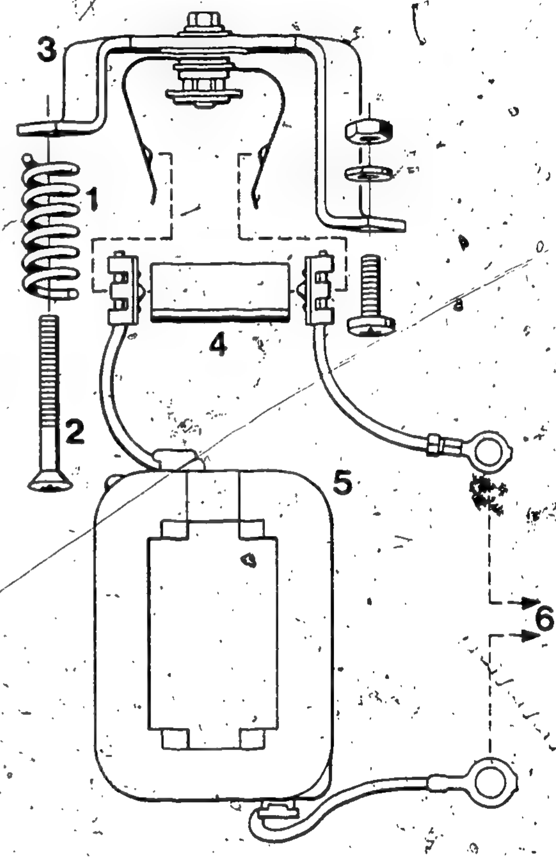


Fig. 1

1 = Adjusting spring
2 = Adjusting screw
3 = Contact breaker
4 = Capacitor
5 = Solenoid winding
6 = To connector

Automotive Equipment – After-sales Service
Department for Technical Publications KH/VDT
Postfach 50, D-7000 Stuttgart 1

Please direct questions and comments concerning the contents to our authorized representative in your country.

Printed in the Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.
(11.76)

2. Attach the capacitor to a new contact breaker and screw the contact breaker into place (Fig. 1). When doing this, be sure to maintain a spacing of a = 1.0 mm$^{-0.5}$ between the iron solenoid core and the resitex contact breaker plate (Fig. 2). If necessary, adjust this spacing by bending the contact breaker support bracket. Attach the cables in the horn as in the original design, using adhesive 5 703 210 150.

3. Clean the old housing seals carefully, grease them lightly, and replace them. If the old set of seals has been damaged, measure the overall thickness of the set and assemble a set of new seals with the same thickness.

   After the horn has been reassembled, check and adjust the armature gap, b. In order to do this, retract the contact breaker using the adjustment screw until the contact breaker no longer operates. Clamp the horn in a vise and, using a dial indicator, measure the distance that the center of the diaphragm moves when the voltage (battery) is applied (= armature gap, b). Adjust the armature gap, b, using suitable paper discs according to the table below.

   Armature gap, b:

0 320 223 002	0.55 ... 0.65 mm
0 320 223 008	0.55 ... 0.65 mm
0 320 226 002	0.55 ... 0.65 mm
0 320 223 003	0.42 ... 0.52 mm
0 320 223 009	0.42 ... 0.52 mm
0 320 223 018	0.42 ... 0.52 mm
0 320 223 023	0.42 ... 0.52 mm
0 320 223 029	0.42 ... 0.52 mm
0 320 226 003	0.42 ... 0.52 mm
0 320 226 009	0.42 ... 0.52 mm
0 320 226 018	0.42 ... 0.52 mm
0 320 223 017	0.70 ... 0.90 mm
0 320 223 022	0.70 ... 0.90 mm
0 320 223 028	0.70 ... 0.90 mm
0 320 226 008	0.70 ... 0.90 mm
0 320 226 017	0.70 ... 0.90 mm

4. Mount the horn with the flexible mounting bracket to a firm support, connect it to a fully charged battery, and turn the adjusting screw until the signal is heard loud and clear. When doing this, the following current values should be maintained:

Horn 12 V, 375 Hz:	2.0 ... 4.6 A
Horn 12 V, 500 Hz:	1.8 ... 3.5 A
Horn 24 V, 375 Hz:	1.1 ... 2.0 A
Horn 24 V, 500 Hz:	1.1 ... 2.0 A

   Seal the adjusting screw using adhesive 5 703 210 150.

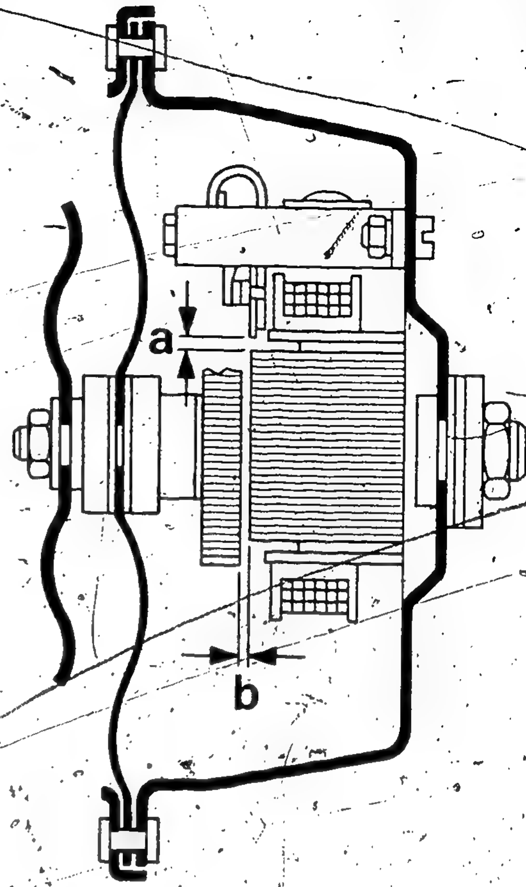


Fig. 2

After-sales Service Instructions

TESTING **033**

VDT-W-335/304 En
Ed.1
Supersedes VDT-WPE 750/1

Tone-sequence control device
0 332 521 . .
0 335 411 005
0 335 411 006
0 335 411 015
0 335 411 016

BOSCH After-sales Service
Automotive
Equipment

G27

This publication has been designed with the forthcoming change-over to microfilm in mind.

When a publication has been transferred to microfilm, the screen will be filled completely by a quarter of a printed publication page. For this reason, it is unavoidable that illustrations are repeated in the case of longer texts in which reference is constantly being made to a particular illustration.

Until the change-over to microfilm, we have slightly reduced the size of the print and of the illustrations.

Contents

Automotive Equipment - After-Sales Service
Department for Technical Publications KH/VDT,
Postfach 50, D-7000 Stuttgart 1

Published by: After-Sales Service Department for Training and Technology (KH/VSK). Press date 3.1981.

Please direct questions and comments concerning the contents to our authorized representative in your country.

Printed in the Federal Republic of Germany. Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.

1. General instructions

It is recommended that the tone-sequence control device is removed for the purposes of testing.

When removed, and during testing, the horns and the rotating beacons are replaced by lamps of the appropriate wattage.
The function of all the connections is tested in this test instruction manual.
If one of the functions has failed, the control device must be replaced.
The control device itself is not repairable.

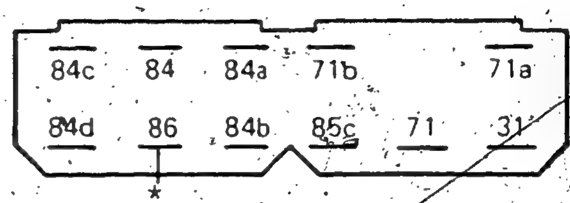
2. Test equipment and devices

1 Voltage stabilizer 0 - 30 V, 0 - 10 A

4 Bulbs 2 W (same voltage as control device) together with the appropriate holders.

2 Bulbs 10 W (same voltage as control device) together with the appropriate holders.

2 Bulbs 45 W (same voltage as control device) together with the appropriate holders.

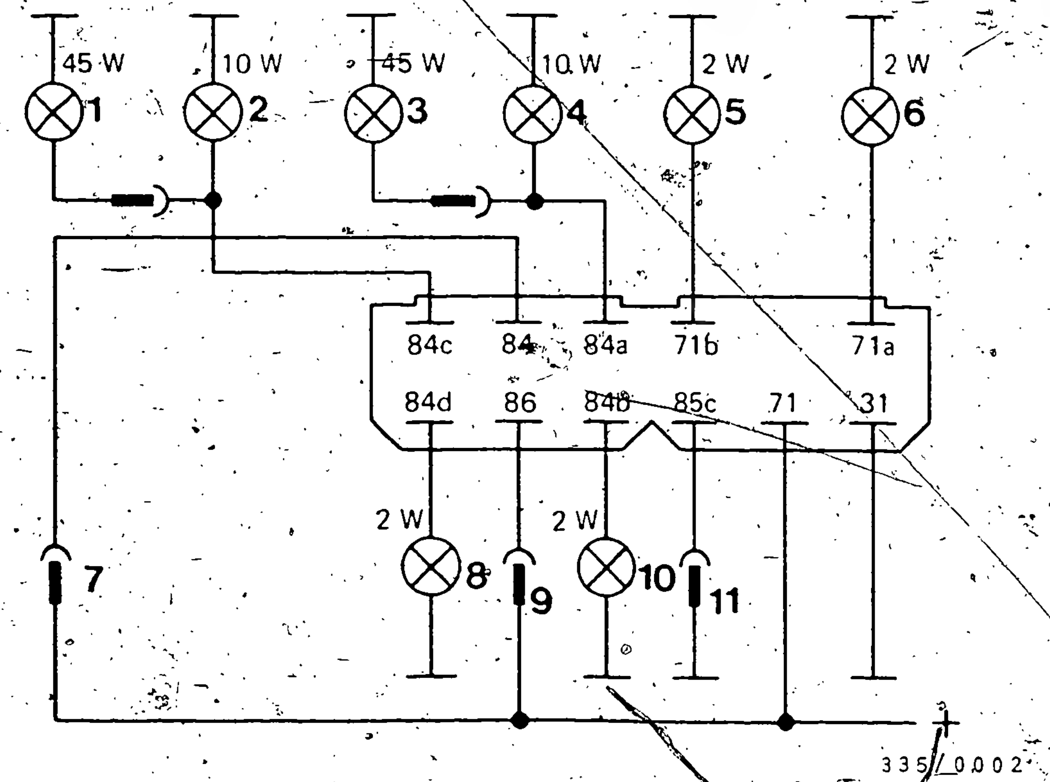


335/0001

3. Test set-up

Terminal connections at the tone-sequence control device

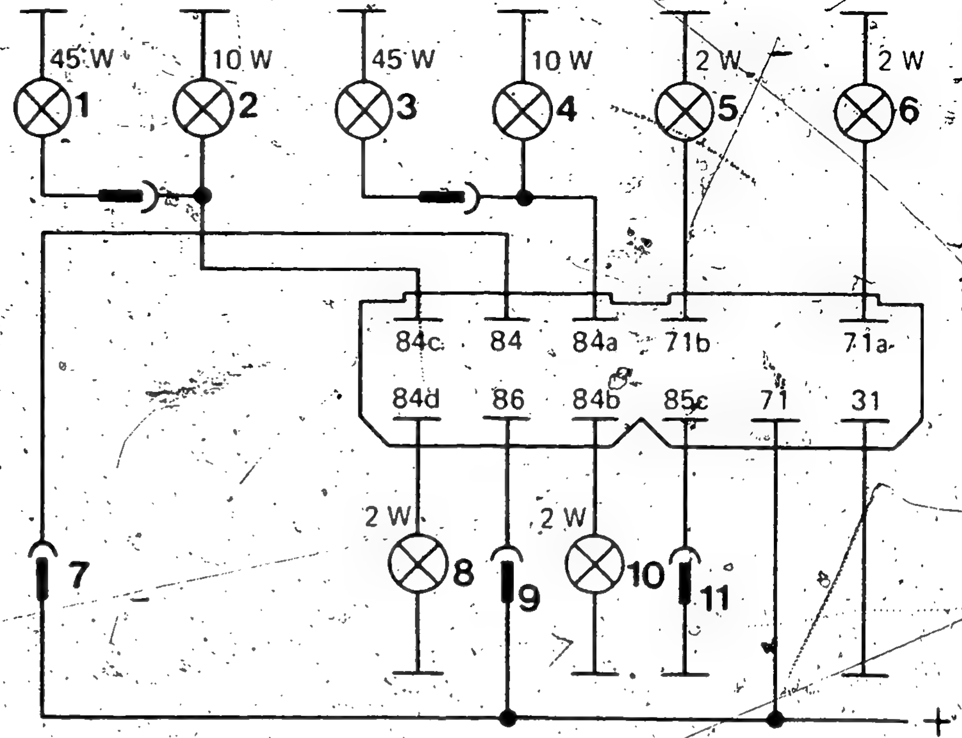
Terminal	31	Ground
	71	Power supply +ve
	71a	Horn connection (deep tone)
	71b	Horn connection (high tone)
	84	Switch on the rotating beacon with +ve
	84a	Connection for 1st rotating beacon
	84b	Repeater lamp for 1st rotating beacon
	84c	Connection for 2nd rotating beacon
	84d	Repeater lamp for 2nd rotating beacon
	85c	Switch on tone sequence with -ve
*	86	Switch on tone sequence with +ve (only with 0 335 411 015 and 016)



Test set-up (cont'd)

1 Test lamp for 2nd rotating beacon
2 Test lamp for motor of 2nd rotating beacon
3 Test lamp for 1st rotating beacon
4 Test lamp for motor of 1st rotating beacon
5 Test lamp for high-tone horn
6 Test lamp for deep-tone horn
7 Plug-in connection for switching on the rotating beacon (n)
8 Repeater lamp for 2nd rotating beacon
9 Plug-in connection for switching on the tone sequence with +ve (only with 0 335 411 015 and 016)
10 Repeater lamp for 1st rotating beacon
11 Plug-in connection for switching on the tone sequence with -ve

N-335/1304

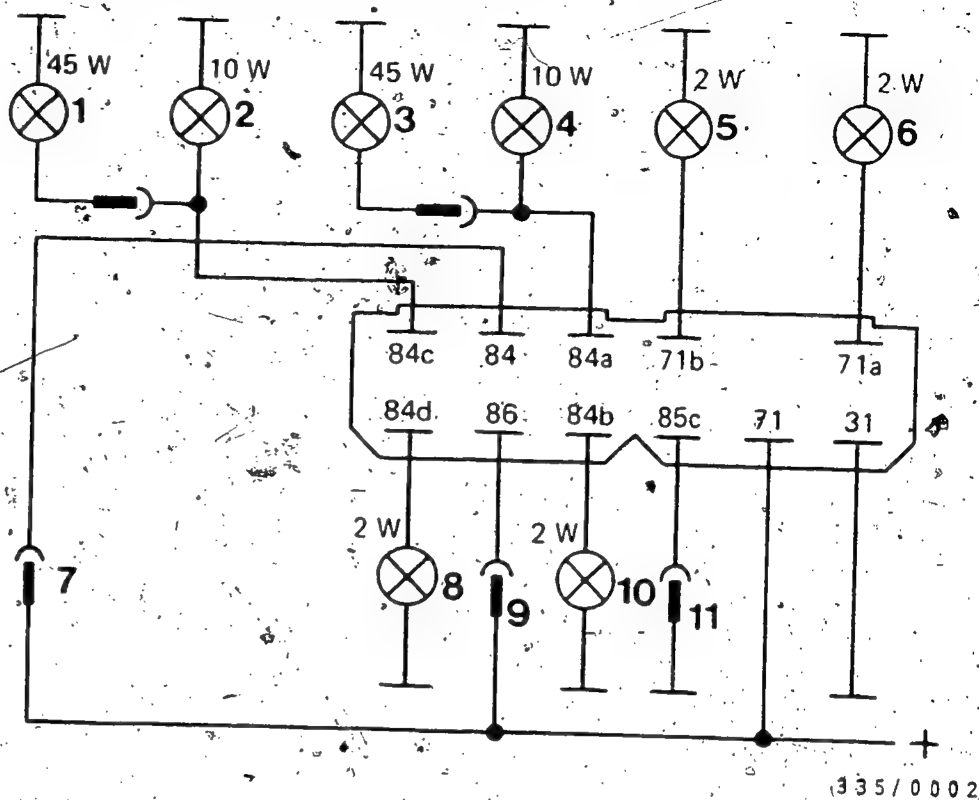


335/0002

Note: Terminals 84c and 84d are intended for the 2nd rotating beacon with repeater lamp. For testing purposes, the test lamps from terminals 84a and 84b can also be connected here.

H4

Test set-up Tone-sequence control device	

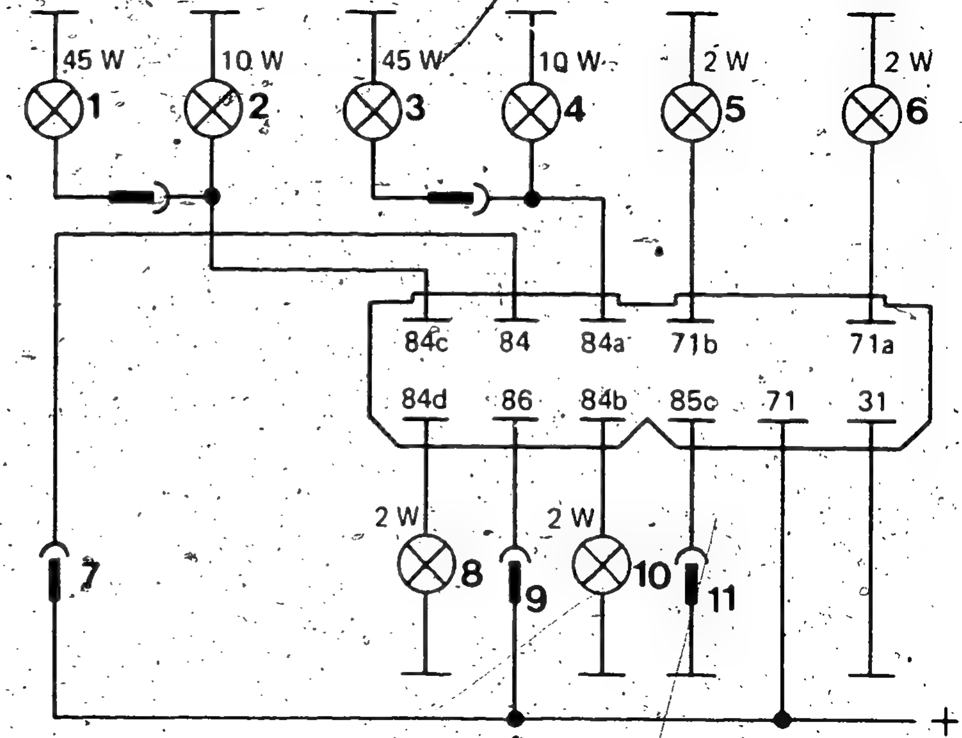


4. Test steps for rotating beacon(s)

Connect-up plug-in connection 7 - this switches on the rotating beacons:

Lamps 3 and 4-or 1 and 2 light up.
Repeater lamp 10 (for 3 and 4) or 8 (for 1 and 2) must light up.

The functions at the terminals 84a, 84b and 84c, 84d can also be tested one after the other.
Disconnect the plug-in connection for lamp 1: repeater lamp 8 must go out.
Disconnect the plug-in connection for lamp 3: repeater lamp 10 must go out.



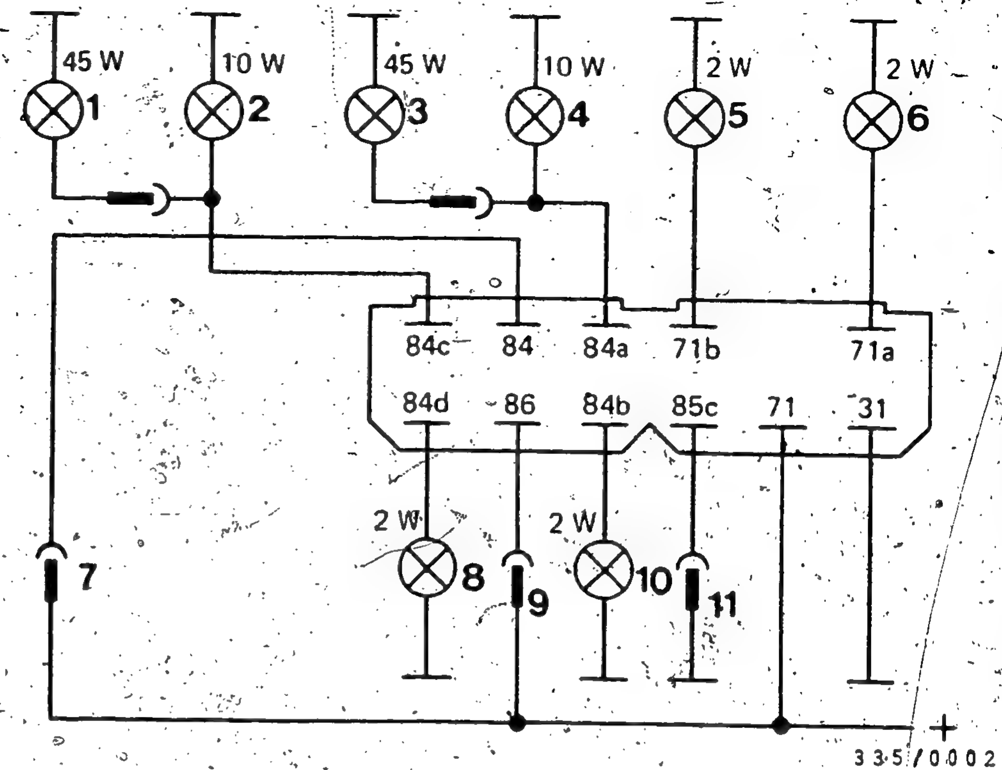
335/0002

Test steps tone-sequence, tone-sequence control device in general*

Disconnect the plug-in connections 7, 9 and 11. Briefly touch the terminal 85c (-ve control) to ground through the plug-in connection 11.

With tone-sequence control device ...015/...016, briefly touch terminal 86 (+ve control) to POSITIVE through terminal 9. For this purpose, plug-in connection 7 must be connected.

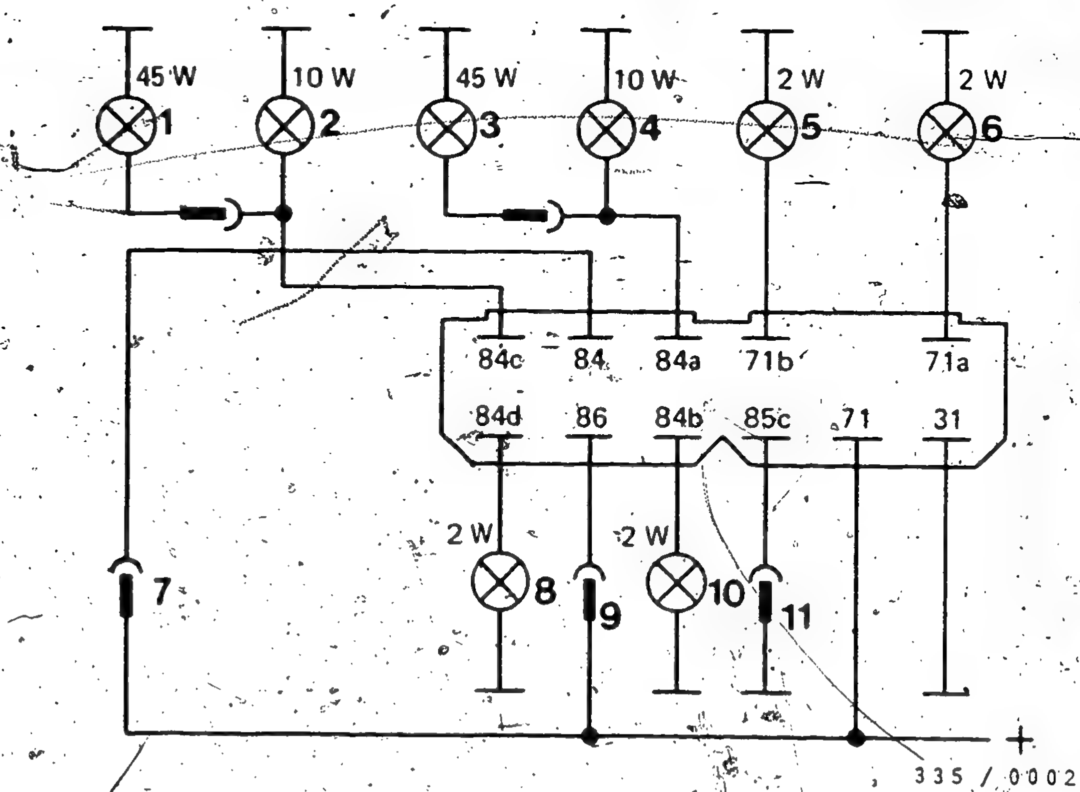
* Safety circuit with 0 335 411 015 and 016: The tone sequence can only be checked if the rotating beacon functions.



Lamps 5 and 6 then light up in the following order (same as tone sequence):

Lamp 6 on, lamp 5 out
Lamp 6 out, lamp 5 on
Lamp 5 out, lamp 6 on
Lamp 6 out, lamp 5 on
Lamps 5 and 6 out

If this is the case, the tone-sequence control device is OK.



Test steps tone-sequence, tone-sequence control device ...015/...016, rotating beacon failed.

Connect terminal 85c (-ve control) to ground:
Lamps 5 and 6 must blink alternately.
Disconnect lamp 1 or 3 from the tone-sequence control device (corresponds to failure of the rotating beacon):
Lamps 5 and 6 go out (tone sequence is interrupted).

If this is the case, the tone-sequence control device is OK.

Testing

30
VDT-W-307/300 En
Ed. 1

Hea... control system
Vac...
with contro... 307 830 100
... aim ... 307 830 001

This publication has been redesigned with the forthcoming change-over to microfilm in mind.
When a publication has been transferred to microfilm, the screen will be filled completely by a quarter of a printed-publication page. For this reason, it is unavoidable that illustrations are repeated in the case of longer texts in which reference is constantly being made to a particular illustration.
Until the change-over to microfilm, we have slightly reduced the size of the print and of the illustrations.

Contents

Automotive Equipment – After-sales Service Department for Technical Publications KH/VDT Postfach 50, D-7000 Stuttgart 1

Published by: After-sales Service Department for Training and Technology (KH/VSK) Please direct questions and comments concerning the contents to our authorized representative in your country.

(5.1979)

1. Testers

Vacuum tester or	e. g. ETT 007.00	0 684 100 700
Pressure-vacuum tester	e. g. ETT 007.01	0 684 100 701
Vacuum pump		
Slide caliper		commercially available

2. Information for workshop

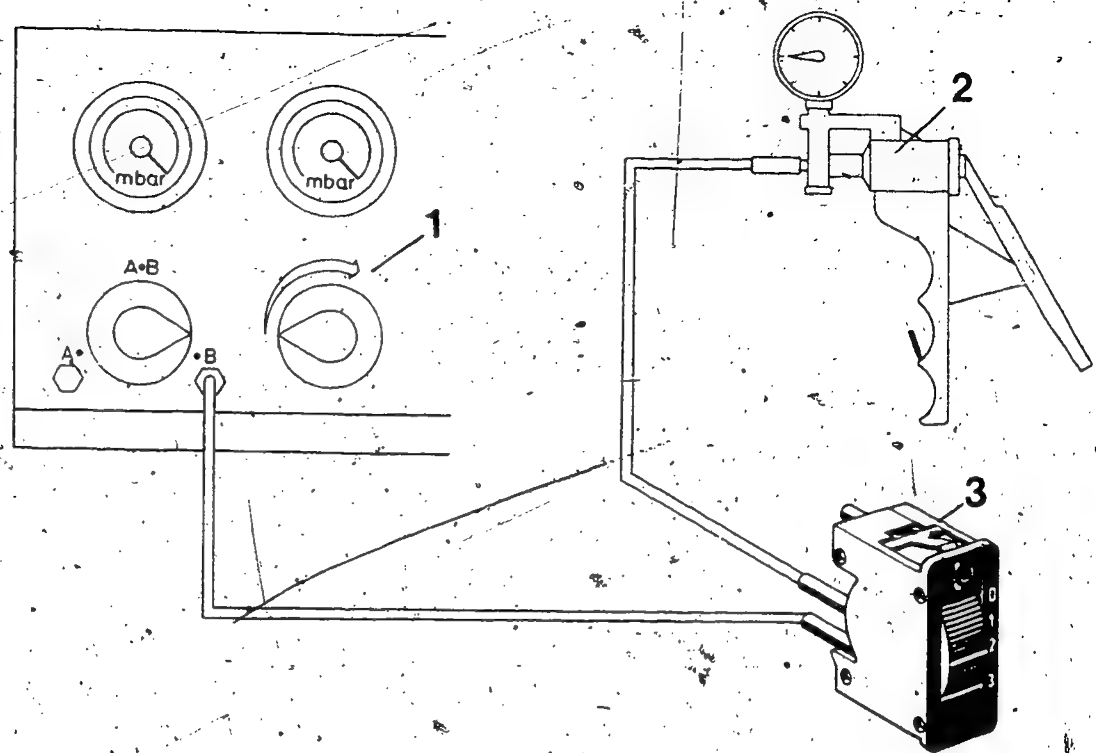
On account of the higher degree of accuracy, the pressure gauge of a Bosch vacuum tester should be employed instead of the pressure gauge on the vacuum pump. The vacuum must be converted if use is made of old testers with a "mm Hg scale".

Example:

$$\frac{\text{mbar}}{1.33} = \text{mm Hg; e. g.} \frac{450 \text{ mbar}}{1.33} = 338.3 \text{ mm Hg}$$

or

$$\text{mm Hg} \times 1.33 = \text{mbar; e. g. } 338.3 \times 1.33 = \sim 450 \text{ mbar}$$



1

1 = Vacuum tester
2 = Vacuum pump
3 = Control switch

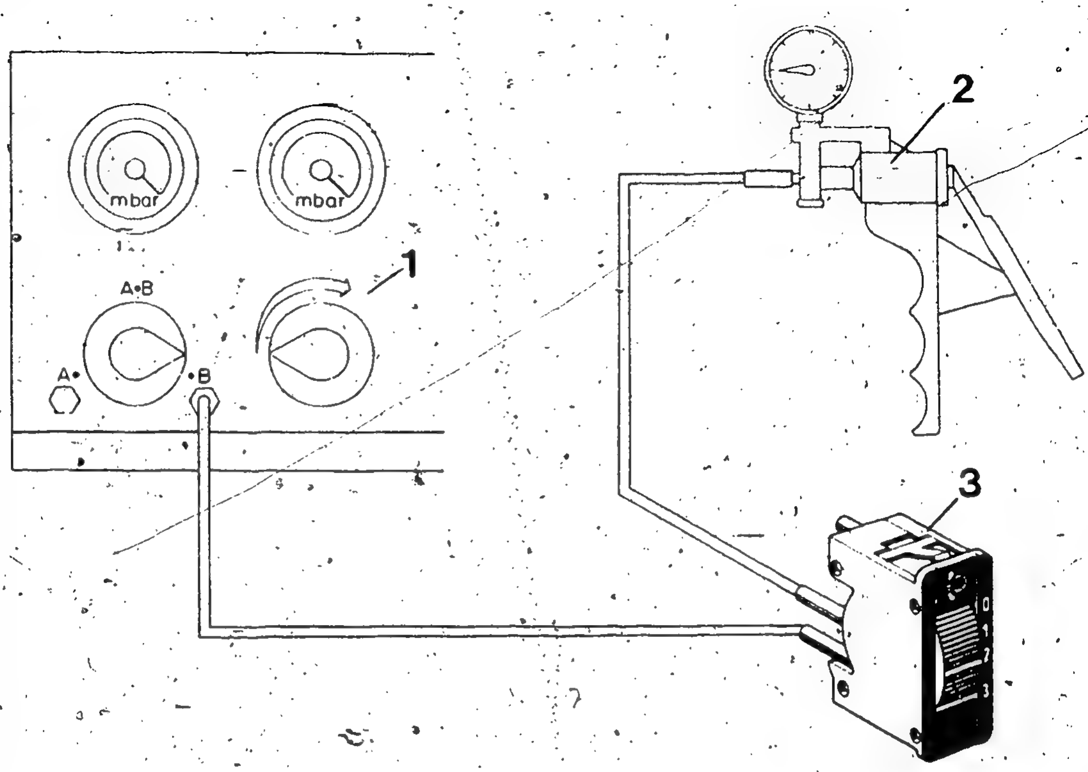
3. Leakage and functional testing of control switch

3.1 Leakage test

Move change-over cock of vacuum tester to position "B". Control valve of vacuum tester is closed. Connect vacuum pump and vacuum tester to control switch (Fig. 1).

Move control switch to position "0" and use vacuum pump to build up 450 mbar vacuum as indicated by **vacuum pump pressure gauge.**

Permissible vacuum drop as indicated by vacuum tester 30 mbar/min.



1 = Vacuum tester
2 = Vacuum pump
3 = Control switch

3.2 Functional test

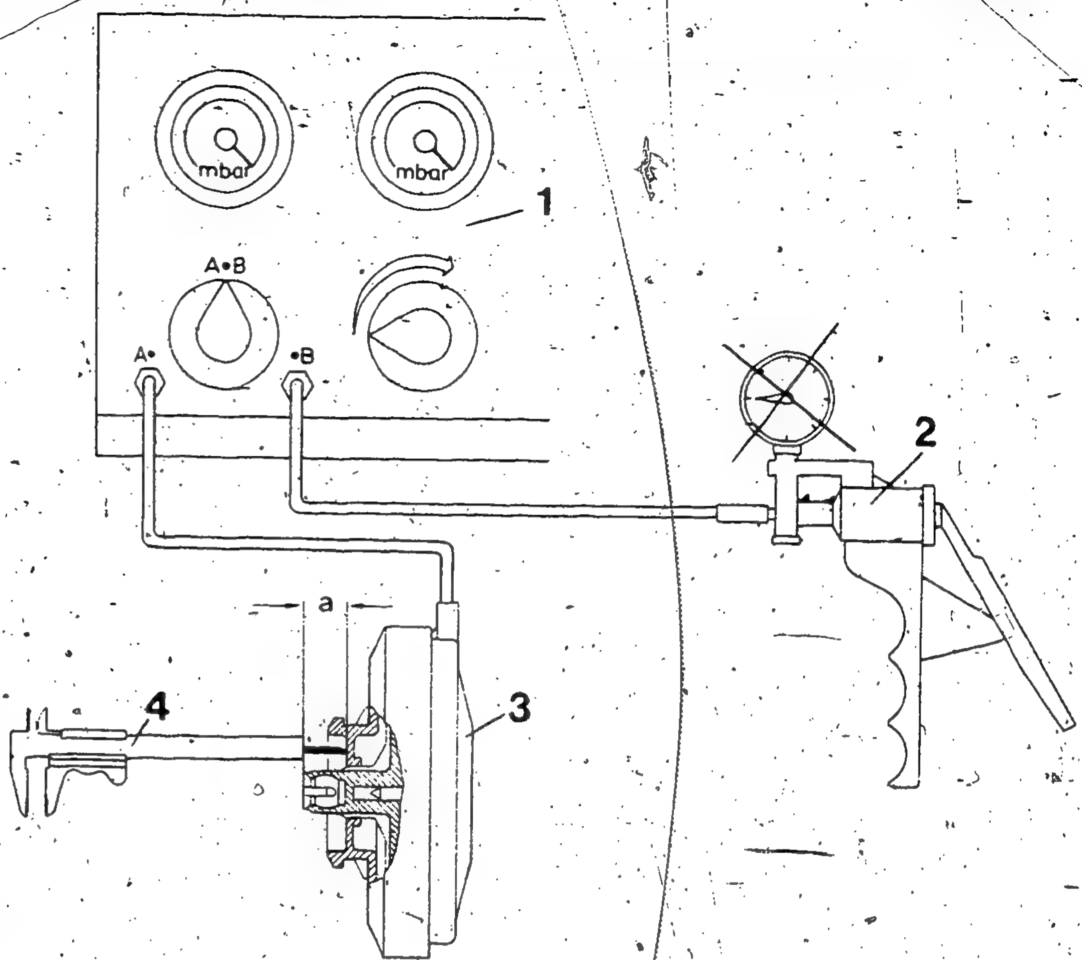
Control valve of vacuum tester is closed. Move control switch to position "0".

Use vacuum pump to build up a vacuum of at least 450 mbar as indicated by **vacuum pump pressure gauge.**

Vacuum indicated by vacuum tester must be 400 ± 20 mbar.

Move control switch to position "3".

Vacuum indicated by vacuum tester must be 50 ± 20 mbar.
If specified values are not reached, control switch must be replaced.



2

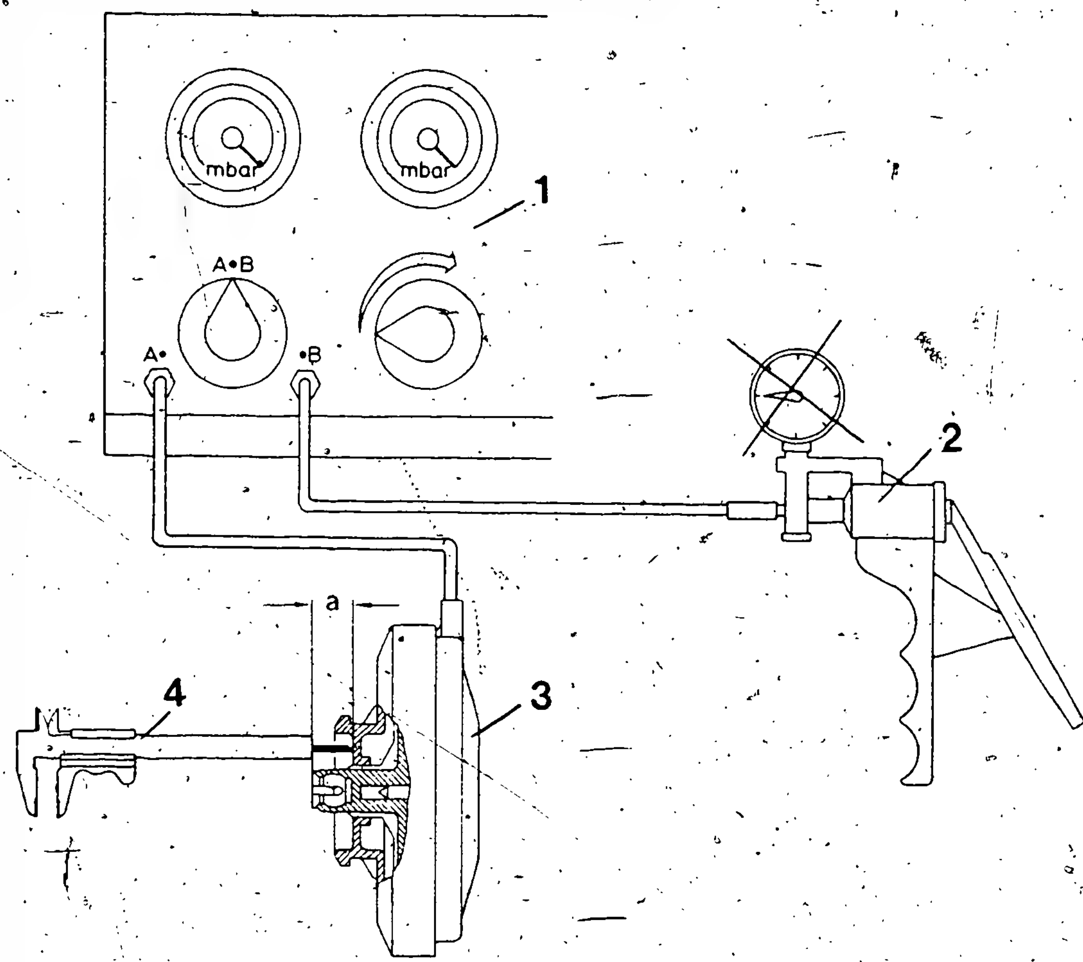
1 = Vacuum tester
2 = Vacuum pump
3 = Aim control element
4 = Slide caliper

4. Leakage and functional testing of aim control element

4.1 Leakage test

Control valve of vacuum tester is closed. Move changeover cock of vacuum tester to position "A–B". Connect vacuum pump and vacuum tester to aim control element (Fig. 2). Use vacuum pump to build up 300 mbar vacuum as indicated by vacuum tester. Permissible vacuum drop as indicated by vacuum tester 5 mbar/min.

If specified values are not reached, aim control element must be replaced.



2

1 = Vacuum tester
2 = Vacuum pump
3 = Aim control element
4 = Slide caliper

4.2 Functional test

Move change-over cock of vacuum tester to position “A–B“. Use vacuum pump to build up 400 ± 20 mbar vacuum **as indicated by vacuum tester.** Measure piston projection (a) at aim control element using slide caliper (Fig. 2). **Open control valve of vacuum tester** and establish a vacuum of 50 ± 20 mbar. Measure new piston projection using slide caliper. If difference between both measurements is less than 2.8 mm, aim control element must be replaced.

Product visual examination criteria with a view to warranty assessment

VDT-I-330/100 En
10.1979
Supersedes Ed. 2.1978

0 332	Mini-relay
0 332 514 ...	Jetronic relay
0 332 525 ...	Taxi alarm
0 333	Battery relay
0 335 ... ... 0 336	Vehicular hazard-warning and turn-signal flasher
0 335 320 ... 0 336 920 ...	Intermittent-wiper switch
0 335 330 ... 0 335 530 ...	Time-lag relay and rotational-speed switch
0 335 411 005	Tone-sequence control device
0 335 411 9..	Car alarm
0 335 550 201	Battery tester
0 336	Hot-wire flasher unit
0 336 851 ...	Vehicular hazard-warning-signal flasher

General information

The table below lists K3 products which **must** undergo visual examination prior to submittal with a view to warranty assessment.
Should you establish any of the faults listed, warranty coverage must be rejected, the damage in such cases being due to improper treatment, incorrect installation, exposure to water or impact.

BOSCH

Geschäftsbereich KH, Kundendienst, Kfz-Ausrüstung.

H16

En 4/16

Part No.	Designation	Visual examination criteria – Fault	Reasons for rejection – Cause of fault
0 332 00. ... 0 332 010 ... 0 332 012 ... 0 332 013 ... 0 332 014 ... 0 332 015 ... 0 332 016 ... 0 332 100 ... 0 332 200 ... 0 332 201 ... 0 332 202 ... 0 332 203 ... 0 332 204 ... 0 332 205 ... 0 332 206 ... 0 332 3.. ... 0 332 4.. ... 0 332 514 0.. 0 332 515 ... 0 332 516 ...	Mini-relay	Remove housing	
		Relay contact outside back-stop – Fig. 1	Improper treatment due to external mechanical impact
		Relay contacts fused or burnt Contact springs tarnished or burnt	External overloading or short-circuit
		Contacts severely eroded	Wear and/or end of useful life
		Internal components dirty or heavily corroded	Exposed installation location or incorrect installation (plug pins not pointing down)
0 332 514 ...	Jetronic relay	Remove housing	
		Relay contacts fused or burnt Contact springs tarnished or burnt	External overloading or short-circuit
		Contacts severely eroded	Wear and/or end of useful life
		Internal components dirty or heavily corroded	Exposed installation location or incorrect installation (plug pins not pointing down)
		Conductors burnt (open-circuit)	External overloading or short-circuit
		Resistor R1 burnt (Fig. 2)	External overloading or short-circuit, or open-circuit or loose contact in **one** positive conductor in vehicle wiring harness
0 332 525 ...	Taxi alarm	Remove hollow rivet heads and housing and unscrew printed board	
		Conductors burnt (open-circuit)	External overloading or short-circuit
		Internal components dirty or heavily corroded	Exposed installation location or incorrect installation (plug pins not pointing down)

Part No.	Designation	Visual examination criteria – Fault	Reasons for rejection – Cause of fault
0 333 300 ... 0 333 301 ...	Battery relay	Remove housing Auxiliary contacts fused or burnt, contact springs tarnished or burnt	External overloading or short-circuit or wear, end of useful life
	Vehicular hazard-warning and turn-signal flasher	Remove housing	
0 335 200 ... 0 335 240 ... 0 336 401 ...	Passenger cars	Conductors burnt (open-circuit)	External overloading or short-circuit
0 335 21 ... 0 336 402 ...	Trucks	Internal components dirty or heavily corroded	Exposed installation location or incorrect installation (plug pins not pointing down)
		Control resistor R7 burnt (open-circuit) Passenger cars – Fig. 3 (arrow) Trucks – Fig. 4 (arrow)	External overloading or short-circuit
		Hinged-armature relay: Relay contacts fused or burnt Contact springs tarnished or burnt	External overloading or short-circuit
		Contacts severely eroded	Wear and/or end of useful life
		Pivoting-armature relay: Carefully lever up housing using a screwdriver in direction of arrow (Fig. 5) Relay contacts fused or burnt Contact springs tarnished or burnt	External overloading or short-circuit
		Contacts severely eroded	Wear and/or end of useful life

Part No.	Designation	Visual examination criteria – Fault	Reasons for rejection – Cause of fault
0 335 320 ... 0 336 920 ...	Intermittent-wiper switch	Remove housing and, depending on model, slacken screws holding printed board:	
		Conductors burnt (open-circuit)	External overloading or short-circuit
		Internal components dirty or heavily corroded	Exposed installation location or incorrect installation (plug pins not pointing down)
		Hinged-armature relay: Relay contacts fused or burnt Contact springs tarnished or burnt	External overloading or short-circuit
		Contacts severely eroded	Wear and/or end of useful life
		Pivoting-armature relay: Carefully lever up housing using a screwdriver in direction of arrow (Fig. 5)	
		Relay contacts fused or burnt Contact springs tarnished or burnt	External overloading or short-circuit
		Contacts severely eroded	Wear and/or end of useful life
0 335 330 ... 0 335 530 ...	Time-lag relay and rotational-speed switch	Remove housing	
		Conductors burnt (open-circuit)	External overloading or short-circuit
		Hinged-armature relay: Relay contacts fused or burnt Contact springs tarnished or burnt	External overloading or short-circuit
		Contacts severely eroded	Wear and/or end of useful life
		Pivoting-armature relay: Carefully lever up housing using a screwdriver in direction of arrow (Fig. 5)	
		Relay contacts fused or burnt Contact springs tarnished or burnt	External overloading or short-circuit
		Contacts severely eroded	Wear and/or end of useful life

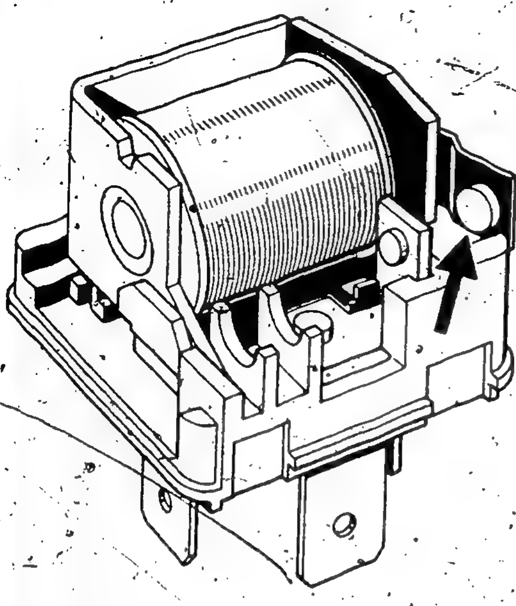
Part No.	Designation	Visual examination criteria – Fault	Reasons for rejection – Cause of fault
0 335 411 005	Tone-sequence control device	Remove housing	
		Conductors burnt (open-circuit)	External overloading or short-circuit
		Internal components dirty or heavily corroded	Exposed installation location or incorrect installation (plug pins not pointing down)
		Control resistor R6 and/or R7 burnt (open-circuit), Fig. 6	External overloading or short-circuit
		Hinged-armature relay: Carefully lever up housing using a screwdriver in direction of arrow (Fig. 5)	
		Relay contacts fused or burnt Contact springs tarnished or burnt	External overloading or short-circuit
		Contacts severely eroded	Wear and/or end of useful life
0 335 411 9..	Car alarm – alarm relay	Remove housing	
		Conductors burnt (open-circuit)	External overloading or short-circuit
		Internal components dirty or heavily corroded	Exposed installation location or incorrect installation (plug pins not pointing down)
		Hinged-armature relay: Relay contacts fused or burnt Contact springs tarnished or burnt	External overloading or short-circuit
		Contacts severely eroded	Wear and/or end of useful life
0 335 550 201	Battery tester	Remove housing	
		Internal components dirty or heavily corroded, results in shunts and/or break in switching spring	Exposed installation location

H 20

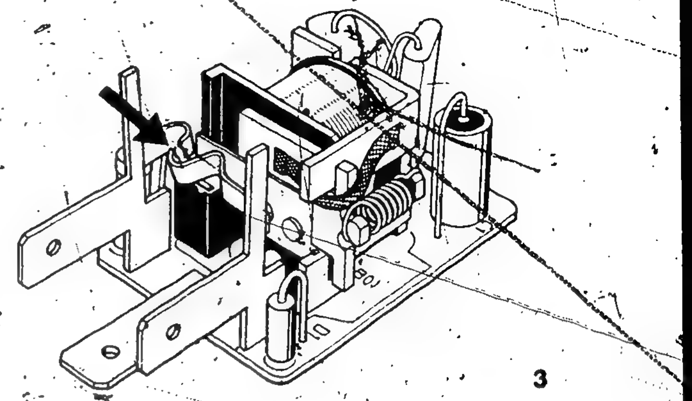
H20

Part No	Designation	Visual examination criteria – Fault	Reasons for rejection – Cause of fault
0 336 1.. ... 0 336 2.. ... 0 336 604 ... 0 336 7.. ...	Hot-wire flasher unit	Impacted or heavily chafed area on housing	Setting altered by improper treatment (impact or shock) or installation
		Opening of turn-signal flasher: Lever up beaded edge using side-cutting pliers, combination pliers or similar	
		Solenoid winding burnt (Figs. 7 and 8)	External overloading or short-circuit
		Armature springs tarnished or contacts tarnished or burnt (Figs. 7 and 8)	
		Turn-signal flasher, start with light emission (0 336 150 ..., 0 336 251 ..., 0 336 256 ...): flasher contacts open instead of closed (Fig. 10)	Hot wire stretched by shock or impact and contacts altered
		Turn-signal flasher, start without light emission (0 336 20. ...): flasher contacts closed instead of open (Fig. 9)	
		Internal components dirty or corroded	Exposed installation location or incorrect installation (plug pins not pointing down)
0 336 851 ...	Vehicular hazard-warning-signal flasher	Remove housing	
		Conductors burnt (open-circuit)	External overloading or short-circuit
		Internal components dirty or heavily corroded	Exposed installation location or incorrect installation (plug pins not pointing down)
		Pivoting-armature relay: Carefully lever up housing using a screwdriver in direction of arrow (Fig. 5)	
		Relay contacts fused or burnt Contact springs tarnished or burnt	External overloading or short-circuit
		Contacts severely eroded	Wear and/or end of useful life

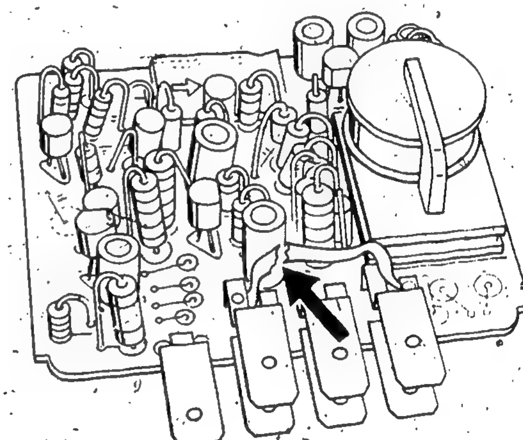
Illustration sheet showing faults (locations indicated by means of a circle or arrow)



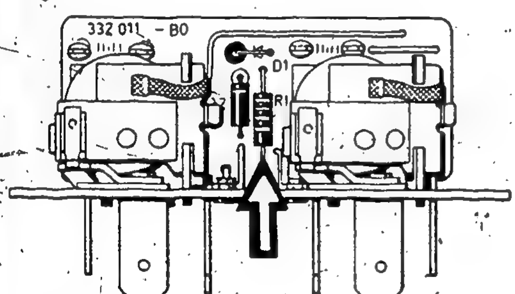
1



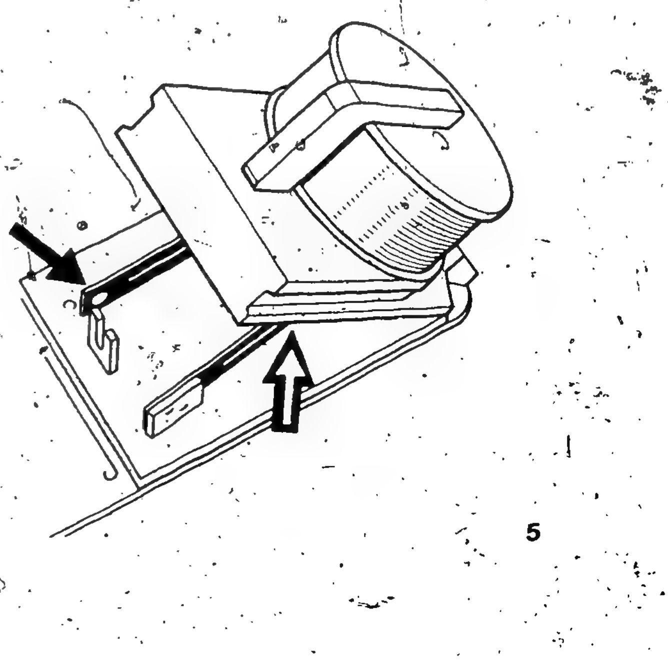
3



4



2

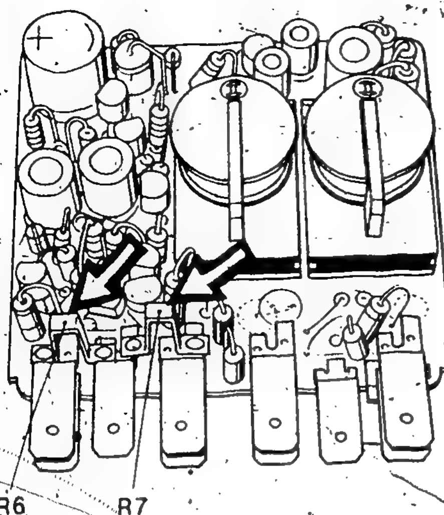


5

H22

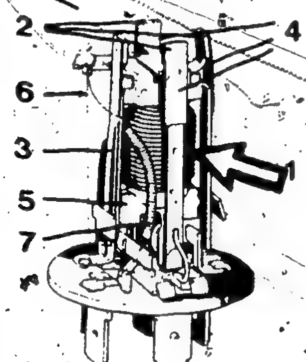
4 2 2

Illustration sheet showing faults (locations indicated by means of a circle or arrow)



6

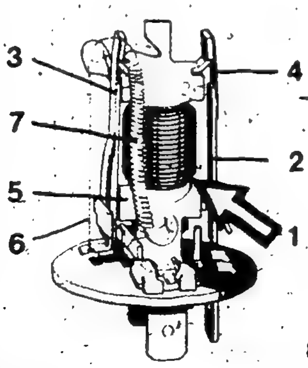
Tone-sequence control device 0 335 411 005



1 = Solenoid winding
2 = Control armature
3 = Flasher armature
4 = Armature spring
5 = Flasher contacts
6 = Hot wire
7 = Resistor

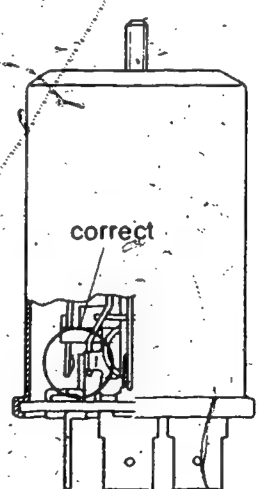
7

Turn-signal flasher with 3 control armatures

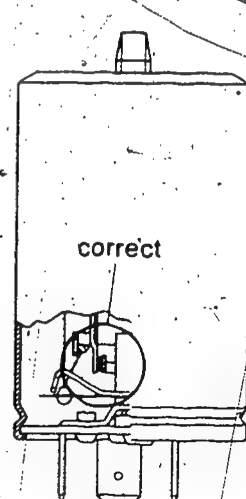


8

Turn-signal flasher with 1 control armature



9



10

BOSCH

TEST INSTRUCTIONS

33

VDT-WPE 713/102 B
Ed. 1

supersedes VDT-WPE 713/2

Test Specifications see VDT-WPE 713/221 B

Start locking relay 0 332 5 . . (0 331 801 . .) SH/AE . . 12 V and 24 V

Start repeating relay 0 332 510 . . (0 331 802 . .) SH/SEW 2/. . 12 V and 24 V

Test Equipment

Test Panel (with Test Prods EFAW 84)	EFAW 81 ..	0 681 ..
Transformer Panel	EFAW 82 ..	0 681 1..
Solenoid Switch Tester	EFSH 2	0 681 134 001
Spring Scale		Commercially available
Feeler Gauge		Commercially available
Test Lamp		Commercially available

General

The operation of the start locking relay depends on the generator voltage. As the voltage reaches a certain value, the cut-off relay pulls in and causes the current to be interrupted in the starting-motor solenoid, which is thus released. A re-engagement is not possible whilst the engine is running. Should the starting process have to be repeated, capacitor discharge prevents this from taking place until 2 or 3 seconds have elapsed, in order ~~to ensure that the~~ pinion cannot engage with the swinging ring gear.

The start repeating relay repeats the starting process in a given manner, if the pinion is unable to engage with the ring gear and the starter switch remains closed. The starting motor solenoid is thereby protected against overheating.

Checking

Make visual examination of the contacts and terminals.

Continuity and Insulation Testing

Set the voltage of the test panel at 6 V d.c. and test windings and contacts for continuity. Detach one end of a winding for testing. Check the insulated contacts and windings for short-circuit to ground. The test voltage for 12 V coils is 40 V a.c. and for 24 V coils 80 V a.c.

Pull-in and Release Voltages

The footnotes given in the "Pull-in Voltage" column also apply to the "Release Voltage" column.
Connect the windings to the "Solenoid Winding" terminals on the solenoid switch tester in accordance with the appropriate instructions (footnotes). The switch contacts on the relay are to be connected to the terminals marked "Switch Contact" on the tester.

When checking the **pull-in voltage**, slowly increase the voltage from zero – gradually reduce the "rated voltage" when checking the **release voltage** – until the switch contact operates (test lamp lights or is extinguished). Voltages measured must be within the tolerances of the test values.

Time-lag

This can be measured with a stop watch.
The start locking relay has a time-lag of 2 to 3 seconds.

Following applies in general:

For testing, tester terminal "Solenoid Winding –" is connected to terminals D– or 31 of the relay and tester terminal "Solenoid Winding +" to terminals 15/54 or 15. Terminals D+ and 15/54 or 15 are linked until all relays have pulled in. The link is then immediately removed. Relay II, and relay IH if present, release at once, relay I only after a time-lag. The test voltage is the rated voltage of the start locking relay to be tested.

Exceptions

0 332 503 001 (SH/AEA 12/1) (Fig. 3):
Resistors W and W_1 are to be unsoldered from D+ before testing.

0 332 504 017:
Positive of supply voltage to **terminal D–, negative** to terminal 15/54.
Connect terminal D+ to the positive terminal until all relays have pulled in, then remove the connection.

H24

H 24

0 332 504 018 and 0 331 801 001 (Fig. 5):
After terminals D+ and 15 are bridged, only relays II and III pull in. Relay I does not pull in until the link has been removed and it releases again after the time-lag.

0 332 518 001 (SH/AEC 24/1) and 0 331 801 007 (Fig. 7):
Point "Y" corresponds to terminal D+.
The diodes (rectifiers) can be tested with an ohmmeter (range 10 kΩ). In the forward direction the resistance is low, in the reverse direction high, although not ∞ Ω, as resistances are in parallel with the diodes.

To measure the time-lag of the start repeating relay, terminal 50g is connected to tester terminal "Solenoid Winding +", terminals 31 and 48 to tester terminal "Solenoid Winding –". For relay 0 331 802 001 (formerly 0 332 510 001) a test lamp is to be connected between terminals 50h and 31, whilst for relay 0 331 802 002 (formerly 0 332 510 002) tester terminals "Switch Contact" should be connected to relay terminals 15 and 50h.

The voltage of 24 to 24.2 V is to be applied directly (not regulated by resistance). The test lamp lights. The cut-off time is the interval between the lighting and extinction of the test lamp. The resetting time is the period from extinction to relighting of the lamp.

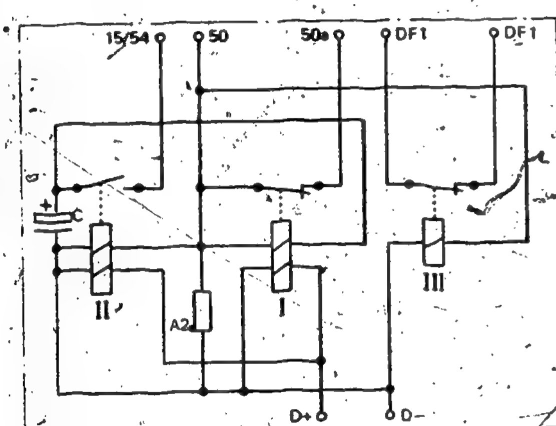


Fig. 1

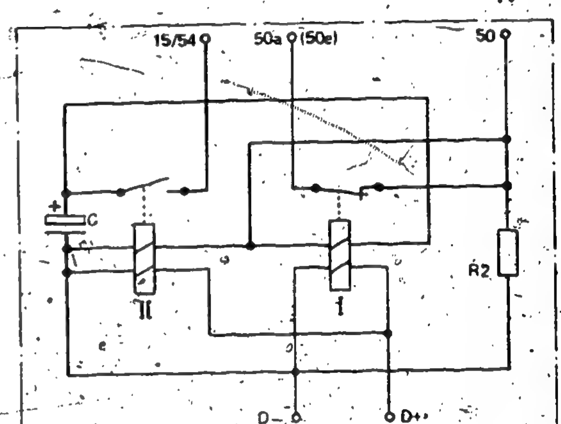


Fig. 2

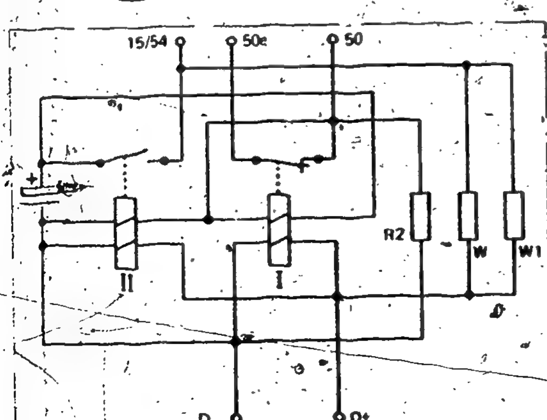


Fig. 3 Unsolder resistors W and W1 for testing

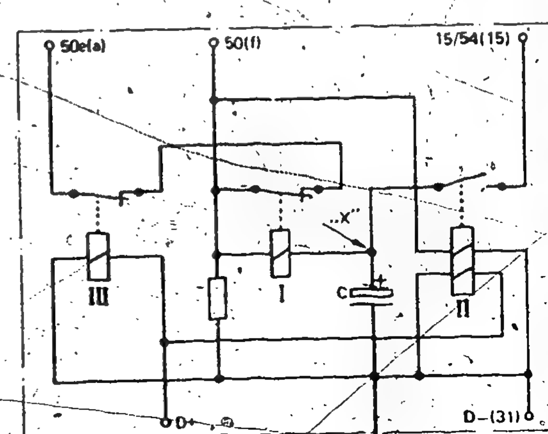


Fig. 4 On 0 332 504 005 insulated terminal 31 instead of D–

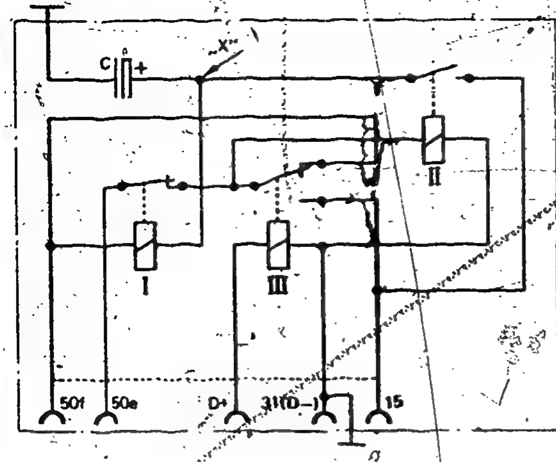


Fig. 5

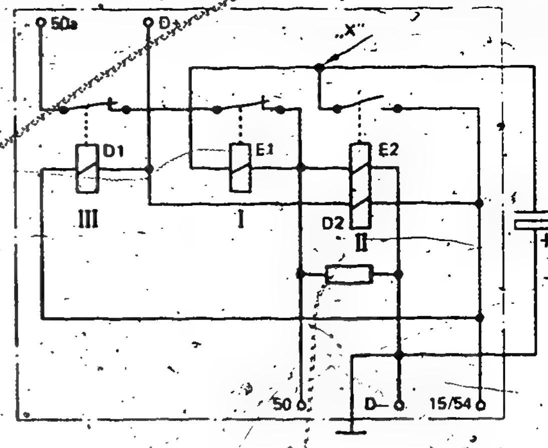


Fig. 6 Battery + connected to vehicle ground

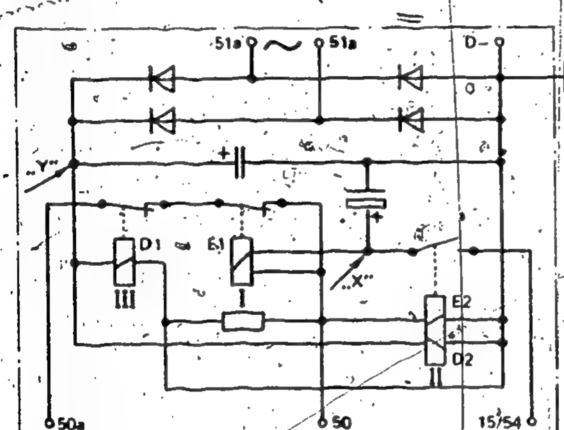


Fig. 7

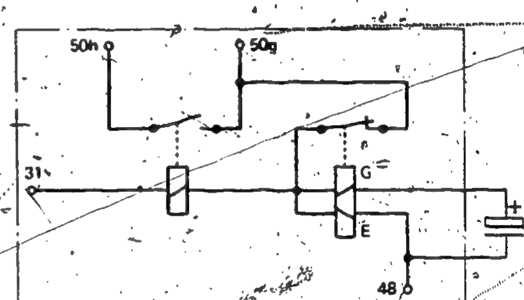


Fig. 8

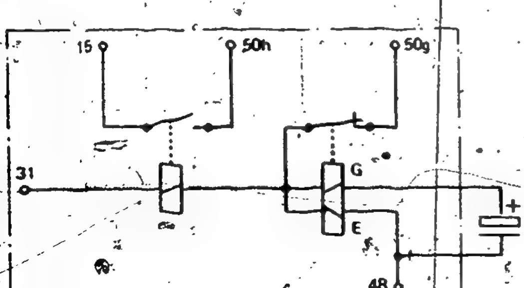


Fig. 9

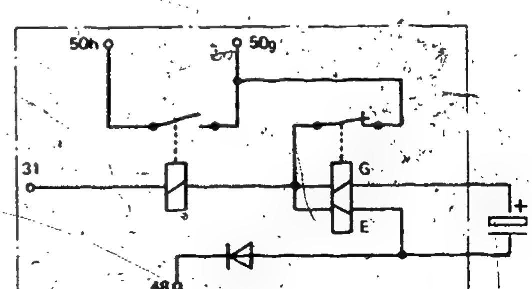


Fig. 10

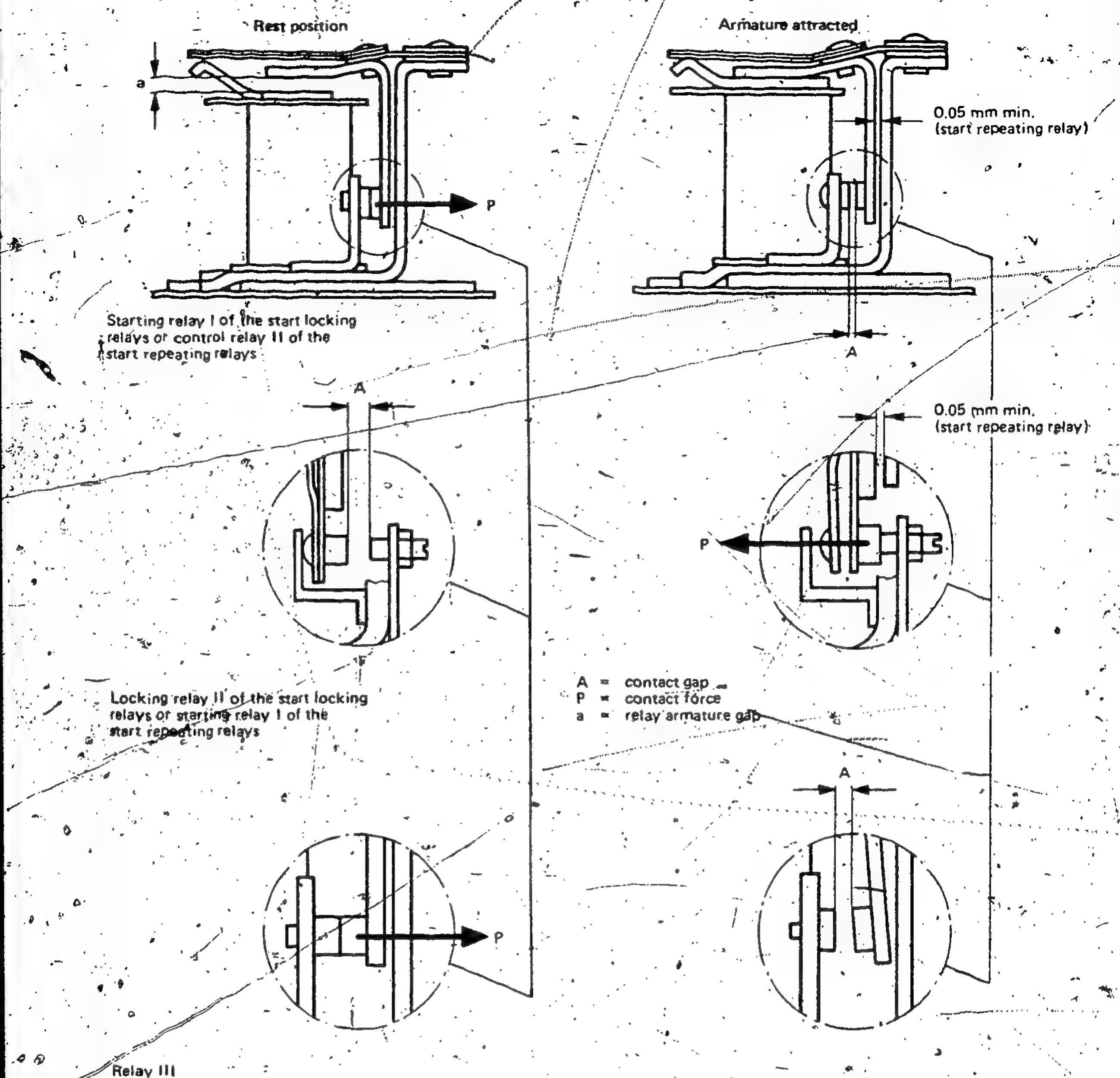


Fig. 11

Robert Bosch GmbH (8.73)
D-7 Stuttgart 1, Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

BOSCH

TEST SPECIFICATIONS

33

VDT-WPE 713/221 B
Ed. 1

supersedes VDT-WPE 713/201

Test Instructions VDT-WPE 713/102 B

Start locking relay 0 332 5 . . (0 331 801 . .)
SH/AE . . 12 V and 24 V

Start repeating relay 0 332 510 . . (0 331 802 . . .)
SH/SEW 2/. . 12 V and 24 V

Part Number 0 332 . . (0 331 . .)	Former Designation SH/ . .	Rated Voltage V	Circuit Diagram [1]	Starting Relay I: Pull-in Voltage V	Release Voltage V	Time-lag s (sec)[2]	Relay Armature Gap "a" mm	Contact Force "P" gramme-force (gf)[3]	Contact Gap "A" mm
502 001	AE 24/1	24	1	19,5 ... 21,0 [4]	4,0 ... 6,0	1,5 ... 2,5	0,4 ... 0,8	80 min.	0,7 ... 1,0
503 001	AEA 12/1	12	3	8,0 ... 8,5 [4]	1,8 ... 3,1	2,0 ... 3,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
002	12/2	12	2	8,0 ... 8,5 [4]	1,2 ... 3,1	2,0 ... 3,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
003	24/1	24	2	12,0 ... 13,0 [4]	2,0 ... 3,0	2,0 ... 3,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
504 001	AEB 12/1	12	4	6,0 ... 9,0 [5]	1,0 ... 3,0	2,0 ... 3,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
002	24/1	24	4	10,5 ... 12,5 [5]	1,5 ... 3,0	2,0 ... 3,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
003	12/3	12	4	6,0 ... 9,0 [5]	1,0 ... 3,0	2,0 ... 3,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
004	12/4	12	4	6,0 ... 9,0 [5]	1,0 ... 3,0	2,0 ... 3,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
005	24/12/2	12/24	4	8,0 ... 12,5 [5]	1,0 ... 3,0	2,0 ... 3,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
006	24/5	24	4	10,5 ... 12,5 [5]	1,5 ... 3,0	2,0 ... 3,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
504 007	AEB 24/3	24	4	8,0 ... 12,5 [5]	1,0 ... 3,0	2,0 ... 3,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
008	24/6	24	4	8,0 ... 12,5 [5]	1,0 ... 3,0	2,0 ... 3,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
010	24/7	24	4	8,0 ... 12,5 [5]	1,0 ... 3,0	2,0 ... 3,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
016	–	24	4	8,0 ... 12,5 [5]	1,0 ... 3,0	2,0 ... 3,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
017	–	24	6	8,0 ... 12,5 [6]	1,0 ... 3,0	2,0 ... 3,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
504 018 (801 001)	–	24	5	8,0 ... 12,5 [5]	1,0 ... 3,0	2,0 ... 3,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
504 019 (801 002)	–	24	4	8,0 ... 12,5 [5]	1,0 ... 3,0	2,0 ... 3,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
504 020 (801 003)	–	24	4	8,0 ... 12,5 [5]	1,0 ... 3,0	2,0 ... 3,0	0,4 ... 0,8	80 min.	0,7 ... 1,0

[1]) See Test Instructions, VDT-WPE 713/102 B
[2]) Test voltage of capacitor: 12 to 14 V for 12 V relay; 24 to 26 V for 24 V relay
[3]) New unit of measurement for force and all units connected with force = Newton (N).
1 kgf = 9,81 N
[4]) Apply voltage to terminals D+ and D– or 31
[5]) Terminals 50 or 50I to negative and point "X" (see circuit diagram) to positive
[6]) Terminal 50 to negative and point "X" (see circuit diagram) to positive

H28

H28

Part Number 0 332 ... (0 331 ...)	Former Designation SH/	Rated Voltage V	Circuit Diagram[1]	Starting Relay I: Pull-in Voltage V	Release Voltage V	Time-lag s (sec)[2]	Relay Armature Gap "a" mm	Contact Force "P" gramme-force (gf)[3]	Contact Gap "A" mm
504 021 (801 004)	–	24	4	8,0 ... 12,5[5]	1,0 ... 3,0	2,0 ... 3,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
504 022 (801 005)	–	12	4	6,0 ... 9,0[5]	1,0 ... 3,0	2,0 ... 3,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
504 023 (801 006)	–	12	4	6,0 ... 9,0[5]	1,0 ... 3,0	2,0 ... 3,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
510 001 (802 001)	SEW 2/1	24	8	4,0 ... 12,0[7]	2,0 ... 3,0	0,8 ... 1,3[8] 0,9 ... 1,8[9]	0,8 ... 1,5	150 min.	0,8 ... 1,2
510 002 (802 002)	2/2	24	9	4,0 ... 12,0[7]	2,0 ... 3,0	0,8 ... 1,3[8] 0,9 ... 1,8[9]	0,8 ... 1,5	150 min.	0,8 ... 1,2
(802 003)	–	24	10	4,0 ... 12,0[7]	2,0 ... 3,0	0,8 ... 1,3[8] 0,9 ... 1,8[9]	0,8 ... 1,5	150 min.	0,8 ... 1,2
518 001 (801 007)	AEC 24/1	24	7	8,0 ... 12,5[5]	1,0 ... 3,0	2,0 ... 3,0	0,4 ... 0,8	80 min.	0,7 ... 1,0

[1]) See Test Instructions, VDT-WPE 713/102 B
[2]) Test voltage of capacitor: 12 to 14 V for 12 V relays
24 to 26 V for 24 V relays
[3]) New unit of measurement for force and all units connected with force = Newton (N).
1 kgf = 9.81 N
[5]) Terminals 50 or 50f to negative and point "X" (see circuit diagram) to positive
[7]) Terminal 50g to positive, terminal 31 to negative
[8]) Cut-off time
[9]) Resetting time

WPE - 713 1221
Seite 3

J2

Locking and Control Relays II

Part Number 0 332 ... (0 331 ...)	Former Designation SH/ ...	Rated Voltage V	Circuit Diagram[1])	Pull-in Voltage V	Release Voltage V	Relay Armature Gap "a" mm	Contact Force "P" gramme force (gf)[3])	Contact Gap "A" mm
502 001	AE 24/1	24	1	3,5 ... 5,5[4])	max. 1,3	0,4 ... 0,8	40 min.	0,6 ... 1,0
503 001	AEA 12/1	12	3	2,8 ... 4,5[4])	0,8 ... 1,2	0,4 ... 0,8	50 min.	0,6 ... 1,0
002	12/2	12	2	2,8 ... 4,5[4])	0,8 ... 1,2	0,4 ... 0,8	50 min.	0,6 ... 1,0
003	24/1	24	2	4,0 ... 6,0[4])	1,2 ... 1,5	0,4 ... 0,8	50 min.	0,6 ... 1,0
504 001	AEB 12/1	12	4	2,5 ... 6,0[4])	0,6 ... 1,2	0,6 ... 1,2	50 min.	0,6 ... 1,0
002	24/1	24	4	4,0 ... 6,0[4])	1,2 ... 1,8	0,6 ... 1,2	50 min.	0,6 ... 1,0
003	12/3	12	4	2,5 ... 6,0[4])	0,6 ... 1,2	0,6 ... 1,2	50 min.	0,6 ... 1,0
004	12/4	12	4	4,0 ... 8,0[4])	2,0 ... 3,0	0,6 ... 1,2	50 min.	0,6 ... 1,0
005	24/12/2	12/24	4	2,5 ... 6,0[4])	0,6 ... 1,2	0,6 ... 1,2	50 min.	0,6 ... 1,0
006	24/5	24	4	4,0 ... 6,0[4])	1,2 ... 1,8	0,6 ... 1,2	50 min.	0,6 ... 1,0
504 007	AEB 24/3	24	4	4,0 ... 8,0[4])	1,2 ... 1,8	0,6 ... 1,2	50 min.	0,6 ... 1,0
008	24/6	24	4	4,0 ... 8,0[4])	1,2 ... 1,8	0,6 ... 1,2	50 min.	0,6 ... 1,0
010	24/7	24	4	4,0 ... 8,0[4])	1,2 ... 1,8	0,6 ... 1,2	50 min.	0,6 ... 1,0
016	–	24	4	10,0 ... 13,0[4])	4,0 ... 6,0	0,6 ... 1,2	50 min.	0,6 ... 1,0
017	–	24	6	10,0 ... 13,0[10])	4,0 ... 6,0	0,6 ... 1,2	50 min.	0,6 ... 1,0
504 018 (801 001)	–	24	5	10,0 ... 14,0[11])	4,0 ... 6,0	0,6 ... 1,2	50 min.	0,6 ... 1,0
504 019 (801 002)	–	24	4	4,0 ... 8,0[4])	1,2 ... 1,8	0,6 ... 1,2	50 min.	0,6 ... 1,0
504 020 (801 003)	–	24	4	4,0 ... 8,0[4])	1,2 ... 1,8	0,6 ... 1,2	50 min.	0,6 ... 1,0

[1]) See Test Instructions, VDT-WPE 7.13/102 B
[3]) New unit of measurement for force and all units connected with force = Newton (N).
1 kgf = 9.81 N
[4]) Apply voltage to terminals D+ and D– or 31.
[10]) Terminal D+ to positive and terminal 15 to negative.
[11]) Terminal 50e to positive, terminal 31 or D– to ground.

4 J2

WPE - 713/12
Seite 4

J3

Locking and Control Relays II

Part Number	Former Designation	Rated Voltage	Circuit Diagram[1]	Pull-in Voltage	Release Voltage	Relay Armature Gap "a"	Contact Force "P"	Contact Gap "A"
0 332 ... (0 331 ...)	SH/	V		V	V	mm	gramme-force (gf)[3])	mm
504 021 (801 004)	–	24	4	10,0 ... 13,0[4])	4,0 ... 6,0	0,6 ... 1,2	50 min.	0,6 ... 1,0
504 022 (801 005)	–	12	4	2,5 ... 6,0[4])	0,6 ... 1,2	0,6 ... 1,2	50 min.	0,6 ... 1,0
504 023 (801 006)	–	12	4	4,0 ... 8,0[4])	2,0 ... 3,0	0,6 ... 1,2	50 min.	0,6 ... 1,0
510 001 (802 001)	SEW 2/1	24	8	15,0 ... 16,0[12])	3,0 ... 6,0	0,5 ... 0,7	80 min.	mind. 0,5
510 002 (802 002)	2/2	24	9	15,0 ... 16,0[12])	3,0 ... 6,0	0,5 ... 0,7	80 min.	mind. 0,5
(802 003)	–	24	10	15,0 ... 16,0[12])	3,0 ... 6,0	0,5 ... 0,7	80 min.	mind. 0,5
518 001 (801 007)	AEC 24/1	24	7	5,5 ... 6,5[13])	0,8 ... 2,3	0,6 ... 1,2	80 min.	0,6 ... 1,0

[1]) See Test Instructions, VDT-WPE 713/102 B
[3]) New unit of measurement for force and all units connected with force = Newton (N).
1 kgf = 9.81 N
[4]) Apply voltage to terminals D+ and D– or 31
[12]) Terminal 50g to positive and terminal 48 to negative.
[13]) Terminal D– to negative, point "Y" (see circuit diagram) to positive.

H3

Cut-off Relays III

Part Number 0 332 (0 331 ..)	Former Designation SH/	Rated Voltage V	Circuit Diagram[1]	Pull-in Voltage V	Release Voltage V	Relay Armature Gap "a" mm	Contact Force "P" gramme-force (gf)[3]	Contact Gap "A" mm
502 001	AE 24/1	24	1	9,0 ... 14,0[14])	8,0 ... 16,0	1,0 ... 1,5	200 min.	mind. 0,3
503 001	AEA 12/1	12	3	–	–	–	–	–
002	12/2	12	2	–	–	–	–	–
003	24/1	24	2	–	–	–	–	–
504 001	AEB 12/1	12	4	2,5 ... 3,5[4])	0,6 ... 2,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
002	24/1	24	4	5,5 ... 6,5[4])	1,2 ... 2,2	0,4 ... 0,8	80 min.	0,7 ... 1,0
003	12/3	12	4	2,5 ... 3,5[4])	0,6 ... 2,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
004	12/4	12	4	6,5 ... 7,5[4])	2,0 ... 4,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
005	24/12/24	12/24	4	2,5 ... 3,5[4])	0,6 ... 2,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
006	24/5	24	4	18,0 ... 19,0[4])	4,0 ... 6,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
504 007	AEB 24/3	24	4	6,0 ... 7,0[4])	1,2 ... 2,2	0,4 ... 0,8	80 min.	0,7 ... 1,0
008	24/6	24	4	18,0 ... 19,0[4])	2,0 ... 6,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
010	24/7	24	4	14,5 ... 15,5[4])	2,0 ... 6,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
016	–	24	4	23,0 ... 24,5[4])	6,0 ... 8,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
017	–	24	6	23,0 ... 24,5[6])	6,0 ... 8,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
504 018 (801 001)	–	24	5	14,0 ... 16,0[4])	10,0 ... 12,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
504 019 (801 002)	–	24	4	6,0 ... 7,0[4])	1,2 ... 2,2	0,4 ... 0,8	80 min.	0,7 ... 1,0
504 020 (801 003)	–	24	4	18,0 ... 19,0[4])	4,0 ... 6,0	0,4 ... 0,8	80 min.	0,7 ... 1,0

[1]) See Test Instructions, VDT-WPE 713/102 B
[3]) New unit of measurement for force and all units connected with force = Newton (N).
1 kgf = 9.81 N
[4]) Apply voltage to terminals D+ and D– or 31
[6]) Terminal 50 to negative and point "X" (see circuit diagram) to positive.
[14]) Apply voltage to terminals 50 and D–

J4

94

Cut-off Relays III

Part Number 0 332 ... (0 331 ...)	Former Designation SH/ ...	Rated Voltage V	Circuit Diagram[1]	Pull-in Voltage V	Release Voltage V	Relay Armature Gap "a" mm	Contact Force "P" gramme-force (gf)[3]	Contact Gap "A" mm
504 021 (801 004)	–	24	4	22,0 ... 23,5[4]	6,0 ... 8,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
504 022 (801 005)	–	12	4	2,[illegible] ... 3,5[4]	0,6 ... 2,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
504 023 (801 006)	–	12	4	6,5 ... 7,5[4]	2,0 ... 4,0	0,4 ... 0,8	80 min.	0,7 ... 1,0
510 001 (802 001)	SEW 2/1	24	8	–	–	–	–	–
510 002 (802 002)	2/2	24	9	–	–	–	–	–
(802 003)	–	24	10	–	–	–	–	–
518 001 (801 007)[13]	AEC 24/L	24	7	4,0 ... 4,5[13]	0,8 ... 1,5	0,4 ... 0,8	80 min.	0,7 ... 1,0

[1]) See Test Instructions, VDT-WPE 713/102 B
[3]) New unit of measurement for force and all units connected with force = Newton (N).
1 kgf = 9.81 N
[4]) Apply voltage to terminals D+ and D– or 31
[13]) Terminal D– to negative and point "Y" (see circuit diagram) to positive.

Robert Bosch GmbH (8.73)
D-7 Stuttgart 1, Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

95

J5

BOSCH

TEST INSTRUCTIONS

33

VDT-WPE 751/101 B

Ed. 1

supersedes VDT-WPE 751/1 B

Electronic Speed Switch

0 333 400 . .
formerly 0 336 611 . .

0 335 530 . .

J6

56

#9

General

The load (e.g. fuel delivery stop solenoid) is replaced by a test lamp during the functional check.
It is not intended that defective speed switches be repaired.

Test Equipment

Ignition distributor test bench	EFZV 10	0 680 123 001
Ignition distributor (4 or 6 cylinder)		0 231 1..
Ignition coil (K 12 V or KW 12 V)		0 221 102..
Battery, 12 V		0 18..
Test lamp 12 V 2 W		

Functional Check on Ignition Distributor Test Bench EFZV 10

Clamp an ignition distributor (4 or 6 cylinder), which must be of a type suited to the speed switch on the test bench. The number of cylinders is determined from the test chart, Column 4. It can also be read from the type label.
Example: 12 V/16, 1/4. The 4 indicates the number of cylinders.

Make sure the distributor is rotating in the correct direction.

See Fig. 1 for connection of the speed switch.
When using ignition coils requiring series resistor (KW), switch in the correct series resistance.

Increase the rotational speed until the test lamp lights up. Except 0 335 530 005; here increase the rotational speed until the test lamp goes out. Compare the indicated cutting-in speed, or cutting-out speed for 0 335 530 005, with the Test Chart, Column 5.

Slowly decrease the rotational speed until the test lamp goes out, or lights up for 0 335 530 005.
The indicated cutting-out speed or cutting-in speed must fall within the tolerances given in test chart, Column 6.

Functional Test in Vehicle

Remove the plug-in connector from the speed switch. With ignition turned on, test the voltage at plug contact 2 of the removed plug. This voltage must be between 11.9 V and 14.5 V.

Connect the test lamp to plug contact 4 of the plug. Start the engine. The test lamp must flash in rhythm with the contact breaker switching frequency.

Re-connect the plug to the switch. Connect voltmeter and test lamp according to Fig. 2. Start engine. Switch "S" must be open.

Increase the engine speed until the test lamp lights up, or goes out for 0 335 530 005.
Compare the indicated speed with test chart, Column 5.

Slowly decrease the engine speed until the test lamp goes out, or lights up for 0 335 530 005.
The indicated speed must fall within the tolerances given in the test chart, Column 6.

① = speed switch
② = battery
③ = ignition coil
④ = ignition distributor
⑤ = spark-gap
⑥ = series resistor (only for KW ignition coils)
⑦ = load (e.g. fuel delivery stop solenoid or solenoid valve)
⑧ = test lamp
⑨ = ignition switch
S = switch "S"
V = voltmeter

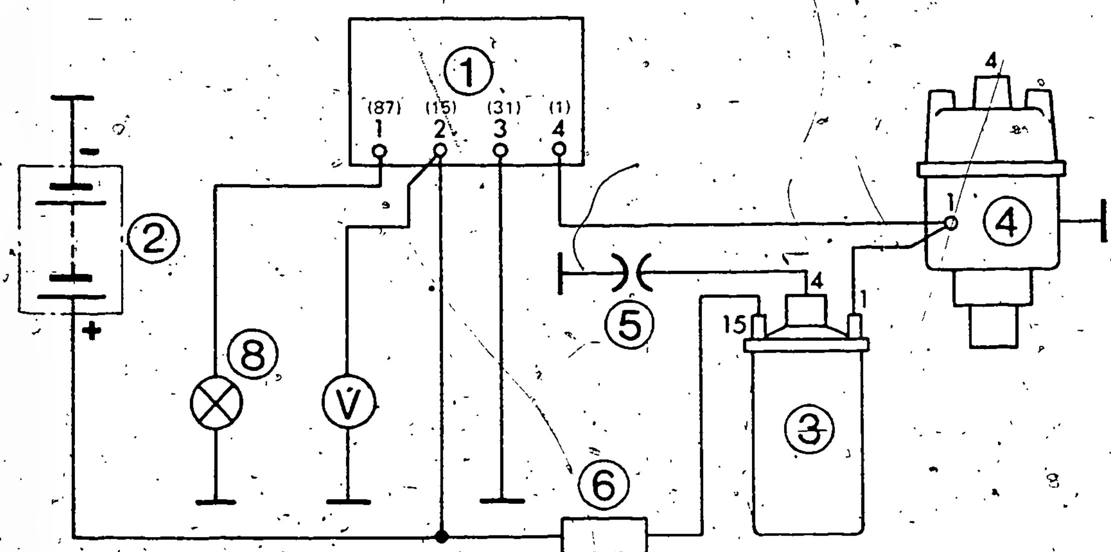


Fig. 1 Connection on Test Bench EFZV 10

Attention!

The **distributor shaft speeds** are given in the test chart. If the engine speeds (crankshaft speeds) are measured, the test chart speeds, as well as the tolerances, should be doubled.

Other possible sources of trouble connected with speed switch:

Control rod from fuel delivery stop solenoid to fuel injection pump sticking.

Fuel delivery stop solenoid defective.

Switch "S" (see Fig. 2) defective.

Test Chart

Test specifications are valid for a battery voltage of 11.9 to 14.5 V at 20° C (68° F).

Bosch Part No.	1 Type marking	2 Rated voltage V	3 Test voltage at plug contact 2 V	4 Number of cylinders	5 Cutting-in speed with increasing distributor speed rev/min	6 Cutting-out speed with decreasing distributor speed rev/min
0 333 400 001 (0 336 611 001)	12 V/13.5/6	12	11.9...14.5	6	760 ± 30	675 ± 30
0 333 400 002 (0 336 611 002)	12 V/21.5/4	12	11.9...14.5	4	1225 ± 30	1075 ± 30
0 333 400 003 (0 336 611 003)	12 V/18.0/6	12	11.9...14.5	6	965 ± 30	900 ± 30
0 333 400 004 (0 336 611 004)	12 V/17.5/4	12	11.9...14.5	4	1025 ± 30	875 ± 30
0 333 400 006 (0 336 611 006)	12 V/15.0/6	12	11.9...14.5	6	805 ± 30	750 ± 30
0 333 400 007 (0 336 611 007)	12 V/18.0/6	12	11.9...14.5	6	960 ± 30	900 ± 30
0 333 400 008 (0 336 611 008)	12 V/16.1/4	12	11.9...14.5	4	955 ± 30	805 ± 30
0 335 530 003	12 V/20/4	12	11.9...14.5	4	1250 ± 30	1000 ± 30
0 335 530 004	12 V/20/4	12	11.9...14.5	4	1250 ± 30	1000 ± 30
0 335 530 005	12 V/25/6	12	11.9...14.5	6	1250 ± 50*	1100 ± 50**
0 335 530 006	12 V/16/4	12	11.9...14.5	4	900 ± 30	800 ± 30

*Cutting-out speed with increasing distributor speed

**Cutting-in speed with decreasing distributor speed

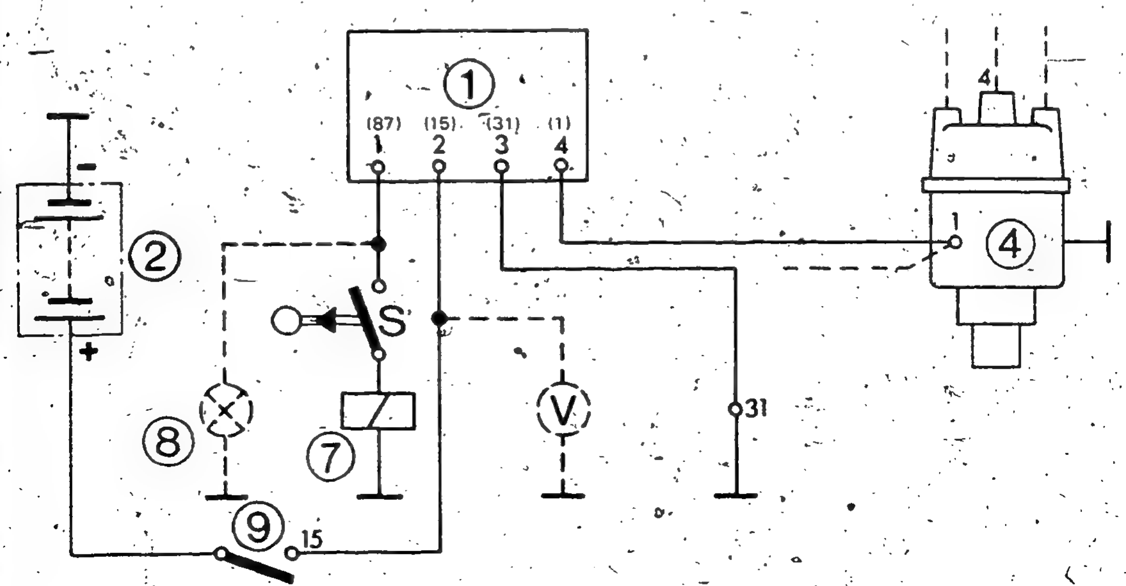


Fig. 2 Connection in vehicle

BOSCH

TEST INSTRUCTIONS
33
VDT-WPE 751/102 B
Ed. 1

Solid-state time-lag relay 0 335 330 001

General

Cold-start valve, thermo-time switch and solenoid switches are replaced by test lamps (12 V, 2 W).

Attention!
Under no circumstances whatsoever are short circuits to appear at the terminals of this time-lag relay during testing, otherwise it may be destroyed.

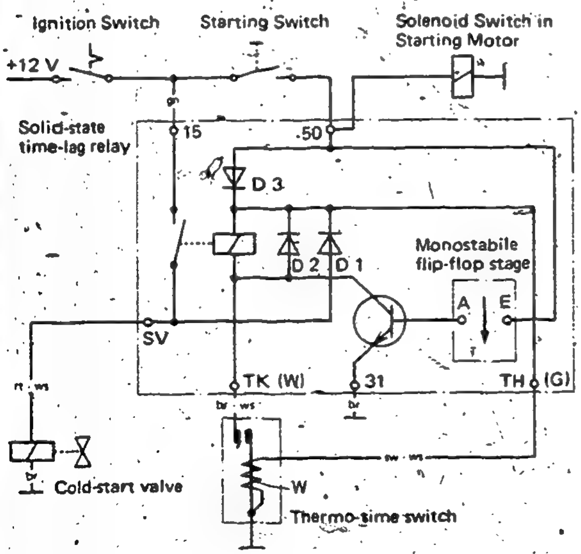
It is not intended that these relays will be repaired.

Further publications:
Description VDT-BEE 751/2.
Testing in vehicle – see Service Information, VDT-I-BMW 001.

Testing

1. Connect up the time-lag relay as shown in Fig. 1. Test lamps must not light up. Press the normally open contact S. Both test lamps must light up and burn further after the opening of the normally open contact.

2. Connect up the time-lag relay according to Fig. 2. Test lamps must not light up. Press the normally open contact S for a short time (less than 1 sec.). Test lamp L 1 must light up for about 1 sec. L 2 must be extinguished immediately after the opening of the contacts.



Connections in motor vehicle

rt = red
ws = white
gn = green
br = brown
sw = black

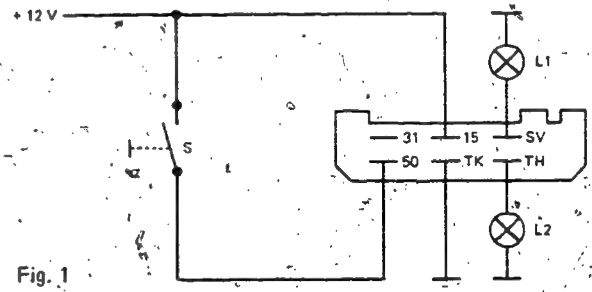


Fig. 1

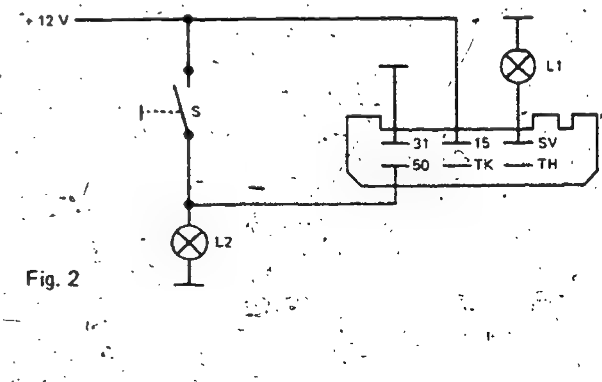


Fig. 2

Robert Bosch GmbH (1.73)
D-7 Stuttgart 1, Postfach 50. Printed in Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.

J9

NEW PRODUCT

VDT-I-335/6 En

Stop-lamp monitor relay

12.1980

The Bosch stop-lamp monitor relay is intended for fitting at a later stage into vehicles with a 12 V electrical system.

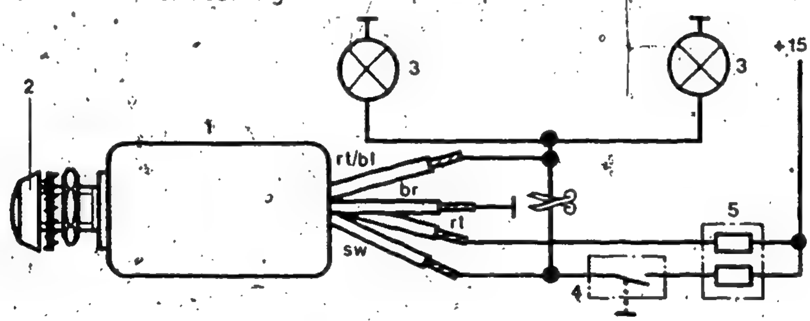
Method of operation

If one or both bulbs in the stop lamps should fail, a visual warning signal is triggered off when the foot brake is applied. The red warning signal lights up. It goes out again when the ignition is switched off and lights up again automatically the next time the brakes are applied.

Please note: Bulbs should be changed only when the ignition is switched off.

Functional control of the stop lamp switch and the stop lamp fuse:
Each time the foot brake is applied the red warning lamp lights up for a short period. This shows that the stop lamp switch and the stop lamp fuse are in working order.

Wiring circuit for monitoring two stop lamps.



1 = stop lamp monitor relay
2 = warning lamp
3 = stop lamps
br = brown
bl/rt = blue/red
rt = red
sw = black

4 = stop lamp switch
5 = fuse box

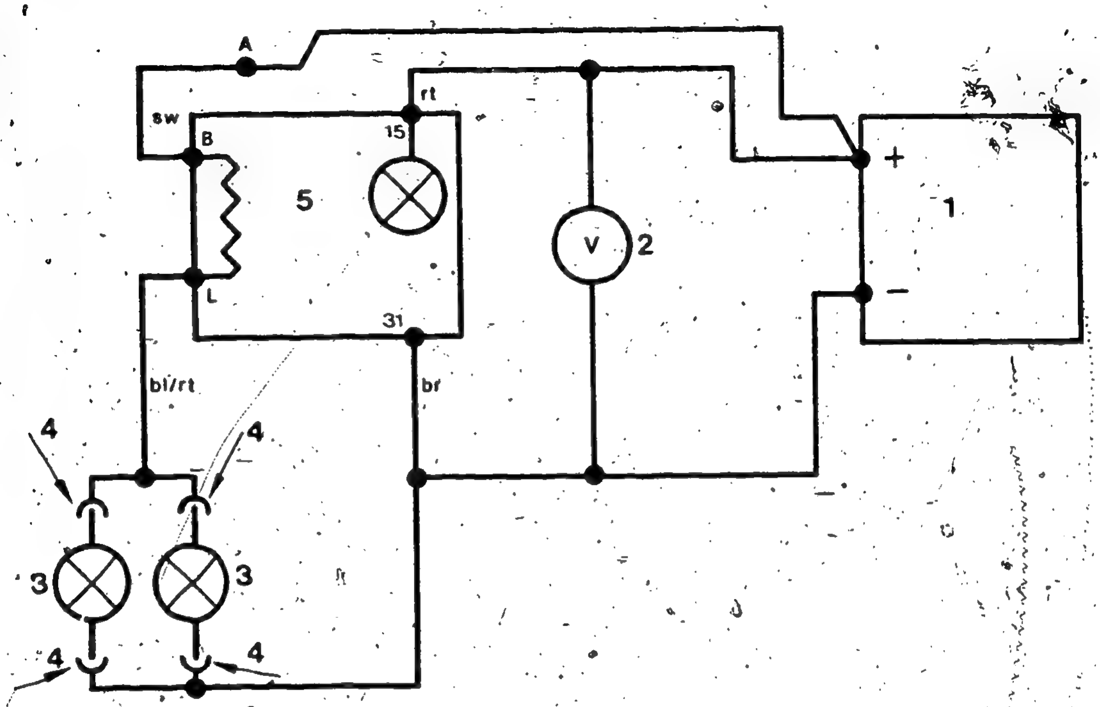
BOSCH Geschäftsbereich KH, Kundendienst, Kfz-Ausrüstung.

J10

When a trailer is coupled on or when additional eye-level stop lamps are used, a second stop-lamp monitor relay must be fitted.

You can check that the additional eye-level stop lamps fitted in the passenger car are working properly by watching their reflection in the rear window through the driving mirror.
If it should be necessary the stop-lamp monitor relay can be tested with very little trouble.

Test set-up



1 = voltage stabilizer 0 - 50 V
0 - 20 A

2 = multimeter, quality class 1.5

3 = bulbs 12 V, 21 W

4 = lamp sockets for item 3

5 = stop lamp control relay (specimen)

br = brown

bl/rt = blue/red

rt = red

sw = black

A = removable connection

Set up the circuit with universal test cables.
Test voltage (U_{pr}) = 13 V.

Testing

If the red warning lamp does not light up during the following test steps, then the bulb in the stop-lamp monitor relay must be checked and, if necessary, replaced.

Test step 1

Remove connection "A", lamps (3) should go out. Reestablish connection "A", lamps (3) should light up again. At the same time the red warning lamp of the specimen should light up briefly with reduced brightness and go out again.

If this happens the specimen is in working order up to now.

Test step 2

Disconnect one lamp (3); the red warning lamp of the specimen must now light up brightly provided that the test voltage (U_{pr}) is connected. When connection "A" is removed the red warning lamp must continue to light up. Even when connection "A" is removed and reestablished several times, the red warning lamp must not go out.

If this is so the specimen is in working order up to now.

Test step 3

Reconnect the other lamp (3). The red warning lamp must continue to light up. Remove connection "A" and reestablish it. The red warning lamp must continue to light up.

If this is so the specimen is in working order.

Test step 4

Switch off the test voltage and switch on again. The lamps (3) should light up. The red warning lamp lights up briefly and goes out again.

If this is so the specimen is in working order.

If one of the test seps 1 - 4 shows that the specimen is not in working order, the stop-lamp monitor relay must be completely replaced.

After-sales Service Instructions

Testing

33
VDT-W-335/305 En
Ed. 1

Stop-Lamp Monitoring Relay 0 335 410 002

(Complete with accessories and packaging 0 335 410 801)

BOSCH After-sales Service Automotive Equipment

J13

This publication has been designed with the forthcoming change-over to microfilm in mind.

When a publication has transferred to microfilm, the screen will be filled completely by a quarter of a printed publication page. For this reason it is unavoidable that illustrations are repeated in the case of longer texts in which reference is constantly being made to a particular illustration.

Until the change-over to microfilm, we have slightly reduced the size of the print and of the illustrations.

Contents

Automotive Equipment - After-Sales Service
Department for Technical Publications KH/VDT,
Postfach 50, D-7000 Stuttgart 1

Published by: After-Sales Service Department for Training and Technology (KH/VSK). Press date 4.1981.

Please direct questions and comments concerning the contents to our authorized representative in your country.

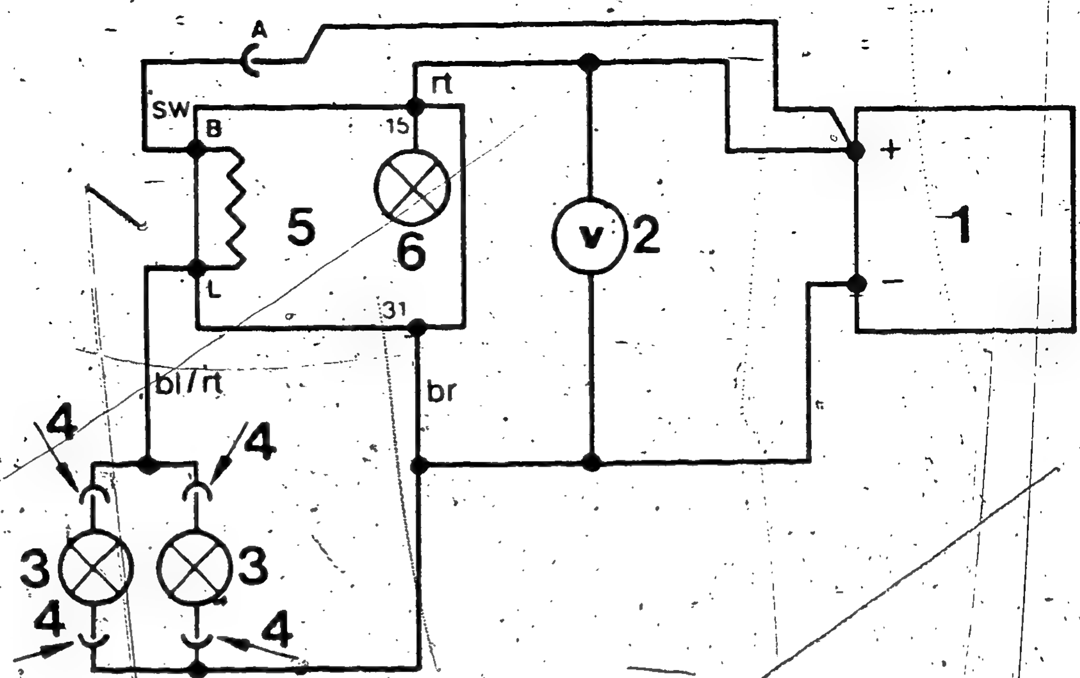
Printed in the Federal Republic of Germany. Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.

2. Instructions

The stop-lamp monitoring-relay is not intended for repair but must be replaced.
The stop-lamp monitoring-relay can be tested with very little technical outlay.

3. Test equipment and devices

1	Voltage stabilizer 30 V, 10 A	Commercially available
1	Electric tester ETE 014.00 or	0 684 101 400
	Multimeter	Commercially available
2	Bulbs 12 V, 21 W with appropriate fittings	



1 = Voltage stabilizer, adjustable from 0 - 30 V, and 0 - 10 A

Test voltage U_t = 13 ± 0.2 V

2 = Electric tester ETE 014.00

3 = LP1, LP2/electric bulbs 12 V, 21 W

4 = Fittings for item 3

5 = Stop-lamp monitoring-relay (specimen under test)

6 = LP3/warning lamp in the monitoring-relay

br = brown
bl/rt = blue/red
rt = red
sw = black
A = separable connection

4. Test set-up

J17

Test set-up Stop-lamp monitoring-relay	

5. Testing

If the red warning lamp does not light up at all during the following test steps, then the bulb in the monitoring relay is to be checked and replaced if necessary.

Test voltage $U_t = 13 \pm 0.2$ V

Test step	Connection A	Lp1 (3) (Stop lamp)	Lp2 (3) (Stop lamp)	Lp3 (6) (Warning lamp)
1	Separated Plugged-in	Goes out Lights up	Goes out Lights up	Dark Lights up briefly
2	Plugged-in Separated Plugged-in Separated	Remove - - -	Lights up Goes out Lights up Goes out	Lights up brightly Lights up brightly Lights up brightly Lights up brightly
3	Separated Plugged-in	Plug in Lights up	Dark Lights up	Lights up brightly Lights up brightly
4	Switch off the test voltage and then switch it back on again			
	Plugged-in	Lights up	Lights up	Lights up briefly

If one of the 4 test steps fails, then the stop-lamp monitoring-relay must be replaced.

Product visual examination criteria for assessing warranty claims

0 342 309 . . – ignition-and-starting switch

General information

The table below lists K3 products which must under all circumstances be subjected to a visual examination prior to warranty claims being submitted.

If the defects listed are detected, the warranty claim must be rejected. The damage involved is due to improper handling, incorrect installation, water or impacts.

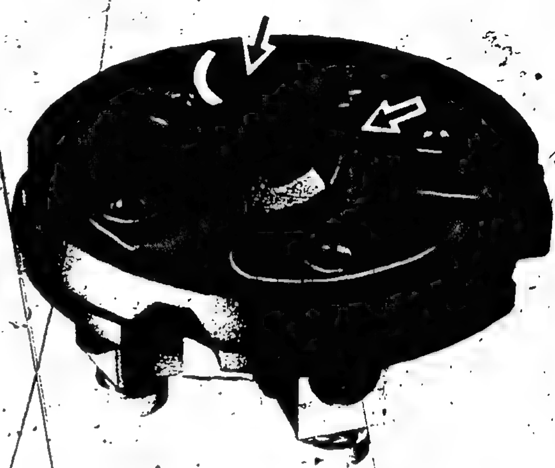


Fig. 1

Part No.	Designation	Visual examination criteria (defects)	Reasons for rejection (cause of defects)
0 342 309 . .	Ignition-and-starting switch	1. Perform functional test: actuate switch several times using key. If lock cylinder jams, open product:	
		2. Remove contact plate after bending up cams Base-plate guide tower for lock cylinder chipped (Fig. 1) (Fragments fall out)	2. Destroyed by use of excessive force
		3. Bridging contact member and switch housing discoloured (water damage)	3. Unprotected installation, giving rise to shunts as a result of moisture

BOSCH
Geschäftsbereich KH Kundendienst, Kfz-Ausrüstung
© by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.

J19

J19

CHANGING THE PIVOTING-ARMATURE RELAY
on electronic vehicular hazard-warning and turn-signal flasher 0 335 210.., 0 335 215..

The electronic vehicular hazard-warning and turn-signal flasher on commercial vehicles belonging to public transport undertakings may fail due to overuse.

By changing the pivoting-armature relay the hazard-warning and turn-signal flasher can in most cases be repaired.

Hazard-warning and turn-signal flasher Part no.	Pivoting-armature relay Part no.
0 335 210 020	0 335 400 310
040	
041	
050	
051	
060	
120	
140	
141	
142	
150	
151	
160	
0 335 215 020	3 337 211 010
030	
040	
041	
050	
051	
060	
120	
130	
131	
140	
141	
142	
150	
151	
160	

BOSCH
Geschäftsbereich KH Kundendienst Kfz-Ausrüstung
© by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50. Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

J20

J20

After-sales Service Instructions

Testing

33

VDT-W-335/302 B
Ed. 1

Electronic
Anti-theft Alarm System
0 335 411 901 12 V

with alarm relay 0 335 411 010
and alarm switch 0 342 006 006

BOSCH After-sales Service Automotive Equipment

J21

General

A plugboard with wiring harness – user-fabrication in accordance with Fig. 1 – and an ohmmeter are necessary for the inspection of the removed alarm relay and alarm switch.

Alarm switch

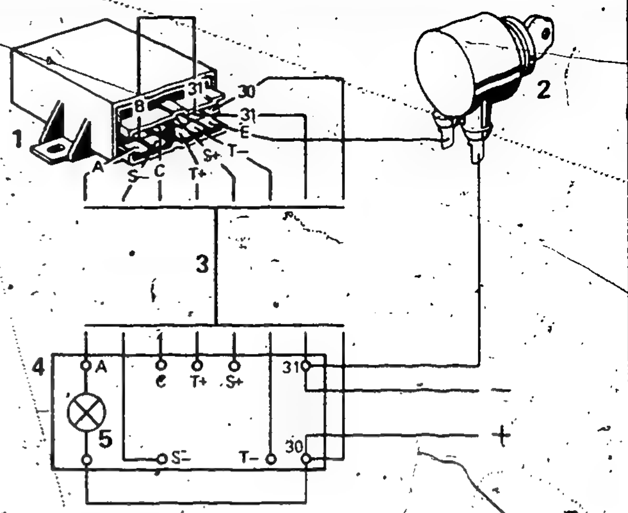
Measurements of resistance between the two connecting lugs of the alarm switch.

Alarm switch switched on 2 ... 3 kΩ
Alarm switch switched off 4 ... 5.5 kΩ

Alarm relay

Connect alarm relay to plugboard via multiple plug and wiring harness and connect alarm switch to relay and plugboard.

Apply battery voltage of 12 V.



1 ≙ Alarm relay
2 = Alarm switch
3 = Wiring harness with multiple plug
4 = Resitex board with phone jacks
5 = Lamp 12 V 5 W

Fig. 1

Switch on alarm switch

Functional test of	Test circuit	Signal
Door contacts	Negative to T-Positive to C+[1]	Lamp flashes
Hood and luggage compartment lid	Negative to S−	Lamp flashes
Fuse circuit	Positive to S+	Lamp flashes
Alarm switch	Negative to cable E	Lamp flashes
	Disconnect cable E	Lamp flashes
Starting interlock	Ohmmeter between terminal C and negative	0 Ω
Depriming the system	Switch off alarm switch	

[1]) In the case of door contact circuit, in accordance with circuit 2 of Service Information VDT-1-Gen./010 B.

If a fault is ascertained, alarm relay and/or alarm switch are to be replaced.

Automotive Equipment – After-sales Service
Department for Technical Publications KH/VDT
Postfach 50, D-7000 Stuttgart 1

Please direct questions and comments concerning the contents to our authorized representative in your country.

Printed in the Federal Republic of Germany.
Imprimé en République d'Allemagne
par Robert Bosch GmbH.
(12.77)

New product

VDT-I-335/10 En

9.1984

BOAT ALARM SYSTEM
0 335 411 912

Since June, 1984, Bosch has had available an alarm system based on the Auto-alarm 1 that is salt-water proof.

The alarm system is switched on or off by a key-operated switch that can be attached on the inside or outside.

Encapsulated switches (Reed contacts) protect the doors of the cabin, engine room, stowage compartment, etc.

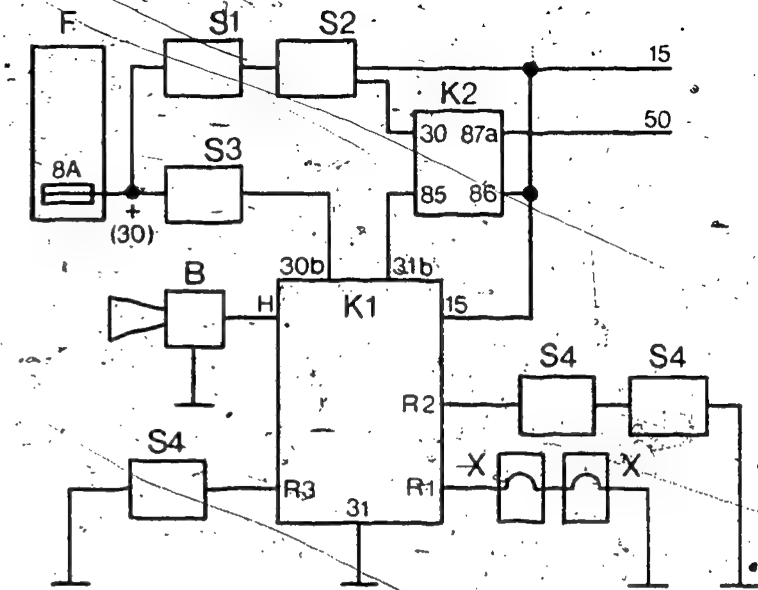
Accessories, such as radio equipment, compass, depth sounders, etc. are protected via a quiescent current group.
The ignition circuit is opened directly via the alarm relay. An additional relay must be built in in order to block the starting motor.

Technical Bulletin

BOSCH Geschäftsbereich KH Kundendienst Kraftfahrzeug-Ausrüstung

J23

J23



B = Alarm horn
F = Fuse
K1 = Alarm relay
K2 = Start blocking relay
S1 = Master switch for battery
S2 = Start switch
S3 = Alarm switch
S4 = Contact switch
X = Accessory

Terminal diagram for the boat alarm system

The alarm is triggered

1. approx. 5 sec. after a secured door is opened.
2. immediately when the ignition is switched on, or when a secured accessory is removed.

The alarm sounds at short intervals for a period of approx. 30 secs.

Issued by:

Robert Bosch GmbH
Division KH
After-Sales Service Department
Schooling and Technology (KH/VSK)
Please direct questions and comments on the contents to to our authorized representative in your country.

MODIFICATION OF ARMATURE AND TOOTHED GEAR

on wiper motors 0 390 341 ..
0 390 342 ..
0 390 346 ..
0 390 347 ..
0 390 356 ..
0 390 357 ..

In order to improve the durability of the worm-gear pair on these wiper motors even under extreme loads, their lead has been increased. The conversion took place during 1974 and 1975. The part numbers of the wiper motors were not changed.

In the current Replacement Parts Microfiche EE .. armature and toothed gear of the new design are already given. When repair work is carried out on motors with date of manufacture before 621, care should be taken to see that armature and toothed gear are replaced as a pair due to the modified lead. However, the cost factor should be taken into account here.

MODIFICATION OF ARMATURE AND TOOTHED GEAR in wiper motors 0 390 442 450 .. 451

VDT-I-390/105 En
12.1983

In the above-mentioned bus wiper motors the lead of the worm-gear transmission has been changed, but the part number of the wiper motors has been retained. For this reason, armature and toothed gear can only be replaced as a pair when repairing motors of the previous version.

The 3rd bearing point of the armature shaft at the end of the drive spindle has also been dispensed with. The new armature can be identified by the fact that the bearing journal is missing.

Installation of the new armature and toothed gear in the previous transmission housing (with bearing point for drive spindle end) is readily possible. If the transmission housing is already without this bearing point, this is a motor of the new version. In this case, armature and toothed gear can also be replaced separately.

The service-parts microfiche EE.. of the latest edition now contains only the part number of the modified parts.

Please direct questions and comments concerning the contents to our authorized representative in your country.

BOSCH Geschäftsbereich KH. Kundendienst. Kfz-Ausrüstung
© by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50. Printed in the Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.

J26

4 26

WS
0 390 50. . – WS/WX. . – Wiper motors VDT–BME 642/5 B .39
Modification of wiping angle <VDT–I–390/100 B>
Edition 9.1974
Translation of German edition of 16.8.1974

Destroy edition of 22.1.1974

In case of wiper motors 0 390 50. . –WS/WX. . it is sometimes necessary to adapt the wiping angle. This is achieved by means of toothed-gear sets. For reasons of organisation, these can no longer be delivered as complete sets. Instead, the individual parts have to be ordered.

Wiping angle	no longer available	replacement	
65°	1 396 100 416	toothed gear	1 396 100 379
		rack	1 393 070 004
		washer	1 230 100 630
		retainer	2 916 080 006
90°	1 397 033 001	toothed gear	1 396 100 380
		rack	1 393 070 004
		washer	1 230 100 630
120°	1 396 100 409	toothed gear	1 396 100 384
		rack	1 393 070 004
		washer	1 230 100 630
		retainer	2 916 080 006
135°	1 396 100 407	toothed gear	1 396 100 386
		rack	1 393 070 004
		washer	1 230 100 630
		retainer	2 916 080 006

In case of inquiry, please contact your authorized representative.

ROBERT BOSCH GMBH
Geschäftsbereich K-Ausrüstung
Handel
Kundendienst-Technik

J27

Steel sheet fan wheels for alternators

Assembly instructions

VDT-I-120/103 B
Suppl. 1
7. 1977

Summary

When assembling the fan wheel and pulley, attention is to be paid to the correct sequence and position of the accessories, in particular the new supporting plate. See Figs. 1 ... 4 for assembly examples:

Details

Since the end of 1976 supporting plate 1 120 140 009 has been mounted between the fan and pulley assembly within the scope of further development for various alternators provided with steel sheet fan wheels.

The outside diameter of this new supporting plate (item a) is 55 mm. The 5 mm wide and approx. 0.3 mm high stamping on the rim presses against the fan. A slotted washer (item b) or the pulley itself is mounted directly on the side facing the pulley, depending on the alternator model. Care is to be taken that the 26 mm diameter collar of the slotted washer or pulley presses against the supporting plate.

In the case of steel sheet pulleys a second slotted washer (item c) is mounted between the pulley and spring lock washer. The spring lock washer or spring washer, as well as the fastening nut remain unchanged.

The tightening torque for the entire assembly continues to be 35 ... 45 N.m (approx. 3.5 ... 4.5 kgf.m).

Tool KDLJ 6006 is required to hold the pulley when tightening the nut.

> Under no circumstances should the fan wheel be locked using a screwdriver or similar. Bent or damaged fan blades result in damage to the alternator.

In the case of alternators which are provided with the supporting plate ex-works, this plate must also be installed when repair work is performed. Basic information regarding use is provided by the service part documents and packing notes for service part packages. Supporting plate 1 120 140 009 is included in the scope of delivery of the pulley.

> The complete assembly is matched to the alignment of the V-belt. Modifications or assembly errors may cause damage.

BOSCH

Geschäftsbereich KH Kundendienst Kfz-Ausrüstung
© by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50. Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.

4 21

J28

Careful replacement of the steel sheet fan wheel when repairing or exchanging the alternator after operating for more than 100 000 km or 2000 running hours is still required.

Assembly examples for supporting plate 1 120 140 009

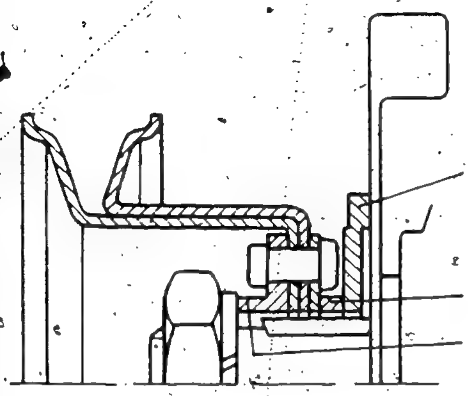


Fig. 1 Single-piece steel sheet pulley with deep hub

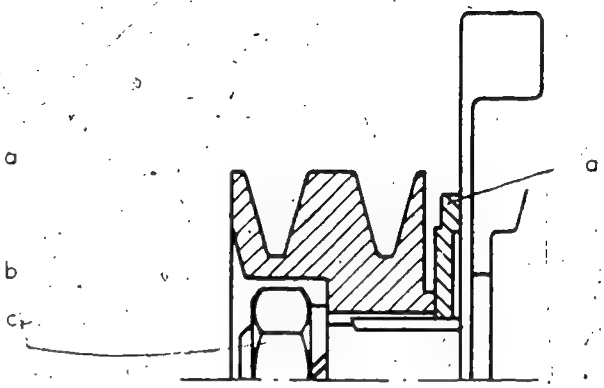


Fig. 2 Solid single-piece pulley

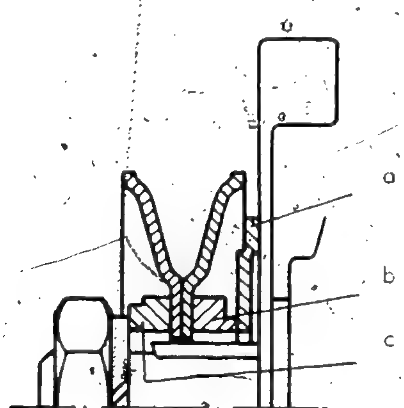


Fig. 3 Two-piece steel sheet pulley

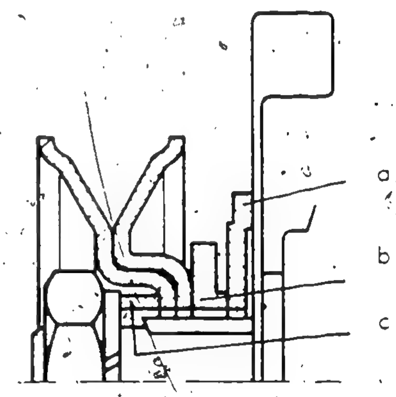


Fig. 4 Offset two-piece steel sheet pulley

Designation of individual components

a Supporting plate 1 120 140 009

b Rear slotted washer

c Front slotted washer

Register 00...12
File
Identity VDT-I-120/125 En

CHANGE OF TYPE CODE FOR

ALTERNATORS

10.1986

0 12. ...

Up to the middle of 1984, alternators were delivered with nameplates on which the rated current at a certain speed was given
(G1 = 7000 min^{-1}, K1 and N1 = 6000 min^{-1}).

Further, after the rated current followed a rotational-speed code. For the alternator concerned this signified:

At 2/3 I_{nom} at the encoded rotational speed of a K1 14V45A20 at 2000 min^{-1} the alternator supplies 30A.

In the future, for new releases only two current values will be provided, e.g. K1-14 V 23/50 A, which signifies:

23 corresponds to 23 A at 1500 min^{-1}
50 corresponds to 50 A at 6000 min^{-1}

The two current values always refer to 1500 min^{-1} and 6000 min^{-1}.

All alternators produced after about the middle of March 1984 have the new type code.

The new type codes are as follows:

Old type code	Current A I_{1500}	Current A I_{6000}	New type code
G1-14V 13A15	8	12	G1-14V 8/12 A
G1-14V 28A22	9	27	G1-14V 9/27 A
G1-14V 33A27	8	32	G1-14V 8/32 A
G1-14V 20A18	11	20	G1-14V 11/20 A
G1-14V 20A21	8	19	G1-14V 8/19 A
K1-14V 32A22	10	32	K1-14V 10/32 A
K1-14V 35A20	16	35	K1-14V 16/35 A
K1-14V 45A24	13	45	K1-14V 13/45 A
K1-14V 45A20	20	45	K1-14V 20/45 A
K1-14V 55A20	23	55	K1-14V 23/55 A
K1-14V 65A21	23	65	K1-14V 23/65 A
K1-14V 70A20	28	70	K1-14V 28/70 A
N1-14V 65A18	32	65	N1-14V 32/65 A
N1-14V 70A20	31	70	N1-14V 32/70 A
N1-14V 70A22	29	80	N1-14V 29/80 A
N1-14V 70A19	36	80	N1-14V 36/80 A
N1-14V 90A22	29	90	N1-14V 29/90 A
N1-14V 90A20	34	90	N1-14V 34/90 A
N1-14V 110A28	–	110	N1-14V 9/110A
G1-28V 19A25	3	18	G1-28V 3/18 A
K1-28V 18A21	5	18	K1-28V 5/18 A
K1-28V 27A23	7	27	K1-28V 7/27 A
K1-28V 28A21	9	28	K1-28V 9/28 A
K1-28V 30A20	10	30	K1-28V 10/30 A
K1-28V 35A22	10	35	K1-28V 10/35 A
K1-28V 35A24	8	35	K1-28V 8/35 A
K1-28V 45A27	3	45	K1-28V 3/45 A
N1-28V 55A25	10	55	N1-28V 10/55 A
N3-28V 35A19	12	35	N3-28V 12/35 A
N3-28V 50A20	15	50	N3-28V 15/50 A
T1-28V 85A14	60	89	T1-28V 60/89 A
T1-28V 85A17	51	92	T1-28V 51/92 A
T1-28V 90A16	53	100	T1-28V 53/100A
T1-28V 95A16	58	105	T1-28V 58/105A
T1-28V 120A17	65	120	T1-28V 65/120A
T1-28V 125A21	33	139	T1-28V 33/139A

4 3

K3

The new type codes are as follows:

Old type code	Current A I_{1500}	Current A I_{6000}	New type code
T2-28V 100A12	82	103	T2-28V 82/103A
T2-28V 170A16	91	179	T2-28V 92/179A

Published by:

Robert Bosch GmbH
Division KH
After-Sales-Service Department
for Training and Technology (KH/VSK)

Please direct questions and comments concerning the contents to our authorized representative in your country.

K4

After-sales Service
Test Specifications

Alternators 0 120 600 5..
0 121 600 5..
0 123 689 5..

Operate alternator only in given
(on fan or alternator housing) direction of rotation

Type	Output test Max. speed 1) min⁻¹	Load A	Resistance values Stator winding 2) Ω ± 10%	Excitation winding (rotor) Ω ± 10%
0 120 600 5.. T 1 (RL) 28 V 125 A 21	1350 1750 2100 3500	20 60 14) 83 125	<0.1	8.5
0 121 600 5.. T 2 (RL) 28 V 62 A 10	930 1050 1300	20 40 62	<0.1	3.6
0 121 600 5.. T 2 (RL) 28 V 85 A 12	930 1300 3500	20 60 14) 85	<0.1	3.6
0 121 600 5.. T 2 (RL) 28 V 100 A 12	900 1200 1300 3500	20 60 14) 75 100	<0.1	2.8
0 121 600 5.. T 2 (RL) 28 V 110 A 13	900 1100 1300 3500	20 60 14) 75 110	<0.1	2.7
0 121 600 5.. T 2 (RL) 28 V 125 A 30	1840 2000 2050 2800	20 60 14) 75 125	<0.1	3.6
0 121 600 5.. T 2 (RL) 28 V 170 A 16	1250 1350 1500 1650 3500	20 60 14) 90 120 170	<0.1	2.7
0 123 689 5.. T 4 (RL) 28 V 60 A 12	800 1200 3500	20 38 58 14)	0.16 8.0 13)	Alternator 9.0 Exciter 9.3 2)

Test specifications for all other alternators are incorporated in the corresponding microfiches.

1) Warm alternator (60°C) with regulator
2) Between phase leads
13) 0.8Ω per winding, footnote 2) does not apply
14) On test bench EFLJ 70 A with lever ratio 0.4 : 1, i.e. alternator pulley Ø 100 mm, largest test bench pulley Ø 250 mm.
On test bench EFLJ 25 with transmission ratio 0.3 : 1, i.e. alternator pulley Ø 100 mm and largest test bench pulley Ø 350 mm.
Test only up to this value.

Geschäftsbereich KH, Kundendienst, Kfz-Ausrüstung.

K5

45

Alternators 0 120 600 5..
0 121 600 5..
0 123 790 5..

Alternators	Collector ring Ø (mm)		Carbon brush projection (mm)	
	new	min. Ø	new	min.
T 1 0 120 600 5.. 0 120 600 5..	 39.7 48.0	 37.7 46	 18.5-22.0 12	 7.0 5.0
T2 0 121 600 5..	48.0	46.0	20	12.0
U 2 0 121 790 5..	72.0	69.0	19	11

Please direct questions and comments concerning the contents to our authorized representative in your country.

In addition to the already familiar EE externally mounted transistor regulators 0 192 052 ..., the regulator 1 197 311 .. (EL 14 V ..) is finding increased application on a variety of different alternator models.

In case of complaints regarding the EL regulator 1 197 311 001/002 - for alternator collector ring with 32 mm diameter - the EL regulator 1 197 311 001 as well as the EE regulator 0 192 052 006 can be used as replacements.
When fitting an EE regulator, it must be taken into account that the housing is larger, that is, fitting space must be available.

The EL regulator 1 197 311 003 and ..004 for alternator collector rings with a diameter of 28 mm can only be replaced by the model 1 197 311 003.
This regulator is fitted with a 68Ω resistor between D+ and D-.

Further EL regulator models not listed here, and their replacements, are to be found in the EE microfiches of the alternators concerned.

It is not possible to fit a regulator with lengthened brush holder (for alternators with collector-ring diameter 28 mm) to alternators with collector-ring diameter 32 mm. Neither can the regulator with lengthened brush holder for 32 mm diameter be fitted to the 28 mm dia. model.

The production of alternators with a collector-ring diameter of 28 mm instead of 32 mm is increasing.

Warranty procedure

The normal warranty conditions apply to the regulator 1 197 311 .. (EL 14 V ..). In the case of justified complaints, the precise part number of the alternator is to be entered in the column for the damaged product.

Alternator operation without battery

General

Unless special measures are taken, alternators are not to be operated without the battery connected because otherwise this can lead to the destruction of semiconductor components in the regulator, alternator or vehicle electrical system.

In the case of special-purpose vehicles, auxiliary or stationary equipment, or vehicle export, it can be necessary for the alternator to operate without battery - with or without power output.

With systems where the regulator is mounted separately from the alternator, the alternator is placed out of operation before starting by open-circuiting the line between it and the regulator. Power output is now impossible.

This method cannot be used with systems having an attached-type regulator. In such cases, the following methods are used. Details can be taken from the product specifications.

1. Systems with increased voltage-proof characteristics

A variety of vehicle manufacturers order such systems because during shipping it can occur that operation takes place without battery. In such exigencies, power output is possible depending upon alternator speed. These measures protect the alternator and regulator but not the loads.

2. Zener diode 1 127 328 .. for 14 V alternators and max. 35 A

This Zener diode is connected to Terminal B+ of the alternator. If the voltage rises above the response voltage of the Zener diode this conducts and the voltage peak is conducted away through the diode heat sink to the alternator housing. In this way semicon-

ductors in the alternator and regulator are protected against voltage peaks and if necessary the system can deliver power. If required, this Zener diode can be fitted as series equipment on new alternators or can be retro-fitted. Connection in parallel or series of these Zener diodes for the purpose of increasing the power is not possible.

Notes on testing are contained in Instructions VDT-W-120/300.

Burnt-out connections between Zener diode and alternator B+ are the result of false polarity during battery change, use of auxiliary starting aids or operation with 24 V etc. Warranty claims are therefore to be rejected.

3. Systems with over-voltage protection devices fitted

For years, such devices (OSG) have been available either integrated in the regulator e.g. 0 192 083... or separate 0 192 900 ... for use in 28 V systems.

When voltages occur in excess of the OSG response voltage, the Terminals D+ and D- are connected together by the OSG. The alternator is short-circuited and cannot self-excite. This means that resultant damage in the vehicle electrical system due to excessive alternator voltage is avoided.

As long as the OSG does not conduct, without battery connected, the alternator can deliver power.

4. Short-circuit capsule 1 120 505 000 for K1, N1 and T1 alternators

In order that the alternator does not self-excite during operation without battery, Terminals D+ and D- are connected together. At customer request, certain alternator models are equipped at the works with a short-circuit capsule connected to Terminal D+ for this reason. This enables engines and vehicles to be tested on dynamometers etc. without the battery being connected. Power cannot be taken from the alternator.

After the battery is connected the capsule is removed so that the system is ready for operation. If, subsequently, operation without battery is required, D+ and D- must be connected together again.

Details regarding the Part Numbers of the products dealt with in this Bulletin can be requested from your local Bosch representative.

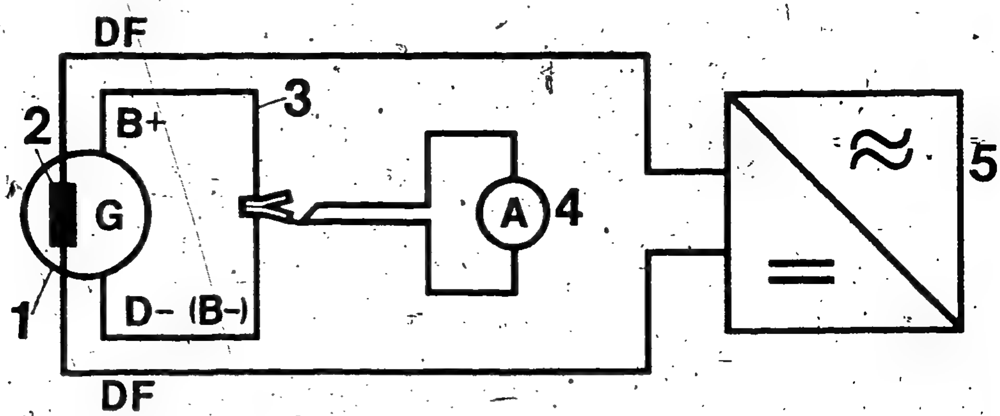
ALTERNATORS LARGER THAN 120 A — VDT-I-120/119 En

Testing on alternator test-bench — 8.1982

With the alternator test benches available at present, alternators with an output of more than 120 A cannot be tested on the higher output range because of the insufficient power of the test equipment.
If an alternator is to be tested on the alternator test bench according to the present test method and if the test equipment does not have sufficient power to test the higher output range of the alternator, then the short-circuit test method can be used.

During the short-circuit test the alternator is externally excited, i.e. the excitation winding is connected to a voltage stabilizer.
A detached regulator must not be connected.
An attached-type regulator must be removed and a suitable brush holder must be used in its place. A suitable brush holder can be made ~~from~~ a defective attached-type regulator.

Test circuit



1 = alternator
2 = excitation winding
3 = short-circuit cable
4 = Electric tester ETE 014.00
5 = voltage stabilizer
e.g. Zentro 30V10A

BOSCH
Geschäftsbereich KH, Kundendienst, Kfz-Ausrüstung.
© by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50. Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.

4.10

Test

1. Calculating the excitation current: $\dfrac{\text{Alternator voltage} - 1.5\ \text{V}}{\text{Excitation resistance} \times 1.5}$

   Example: $\dfrac{28\ \text{V} - 1.5\ \text{V}}{2.7\ \Omega \times 1.5} = \dfrac{26.5\ \text{V}}{4.05\ \Omega} = 6.55\ \text{A}$

2. Short circuit the alternator between B+ and D- with ground strap or with cable with large cross-section (per 16 A ~ 1 mm^2).

3. Set the current limitation on the voltage stabilizer to the excitation current calculated.

4. Connect the current clip of the electric tester onto the short-circuit cable.

5. Fasten the excitation-winding connections to the voltage stabilizer.

6. Start the alternator test bench and set the test speed.

7. Rev up the voltage regulator on the stabilizer until the calculated excitation current is reached (see example). If necessary, adjust the test speed on the test bench.

8. Only operate for a short period, not for any length of time.

9. Read off the actual value on the electric tester and compare with the nominal value given in the test specification sheet. If the alternator does not reach its top output at the test speed given and when set at the excitation current, then the output part of the alternator is defective. The defective alternator should be repaired.

K11

ALTERNATORS 0 120 339.., VDT-I-120/121 En

.. 469 .., .. 489 .. 1.1986

Replacement of attached-type regulator supersedes Ed.12.1983

The attached-type transistor regulators in discrete design 0 192 052 .. (EE - 14 V) have already been changed over to the hybrid design 1 197 311 .. (EL - 14 V).

In case of replacement, use in future the aftermarket hybrid regulator

1 197 311 090

for the following EE regulators:

0 192 052 004	0 192 052 013
.. 005	.. 014
.. 006	.. 017
.. 008	.. 026
.. 012	.. 028

The EL regulators 1 197 311 001 and .. 002 can also be replaced by the aftermarket hybrid regulator. This also dispenses with the reworking on the 40 mm wide penetration on the collector-ring end shield of the previous version, because there is no longer any danger of short circuit with the aftermarket hybrid regulator.

Exception:
On G 1 alternators in BMW motorcycles, continue to install the EL regulator as per service-parts list.

Published by:
ROBERT BOSCH GMBH
Division KH
Technical After-Sales Service (KH/VKD 2)
Please direct questions and comments concerning the contents to our authorized representative in your country.

Technical Bulletin

After-sales Service Instructions

REPAIRS **12**

VDT-W-120/104 En
Ed. 2

Carbon-brush replacement on alternators with fitted transistor regulators EL 14 V . . 1197311 . .

BOSCH After-sales Service Automotive Equipment

K13

This publication has been redesigned with the forthcoming change-over to microfilm in mind.

When a publication has been transferred to microfilm, the screen will be filled completely by a quarter of a printed publication page. For this reason, it is unavoidable that illustrations are repeated in the case of longer texts in which reference is constantly being made to a particular illustration.

Until the change-over to microfilm, we have slightly reduced the size of the print and of the illustrations.

Contents | Coordinate

Automotive Equipment - After-Sales Service
Department for Technical Publications KH/VDT
Postfach 50, D-7000 Stuttgart 1

Published by: After-Sales Service
Department for Training and Technology (KH/VSK)
Editorial closing: 3.1981.

Please direct questions and comments concerning the contents to our authorized representative in your country.

Printed in the Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne
par Robert Bosch GmbH.

Test Equipment

Resistor	ETE 014.00	0 684 101 400
or	Metravo 2h	commercially available

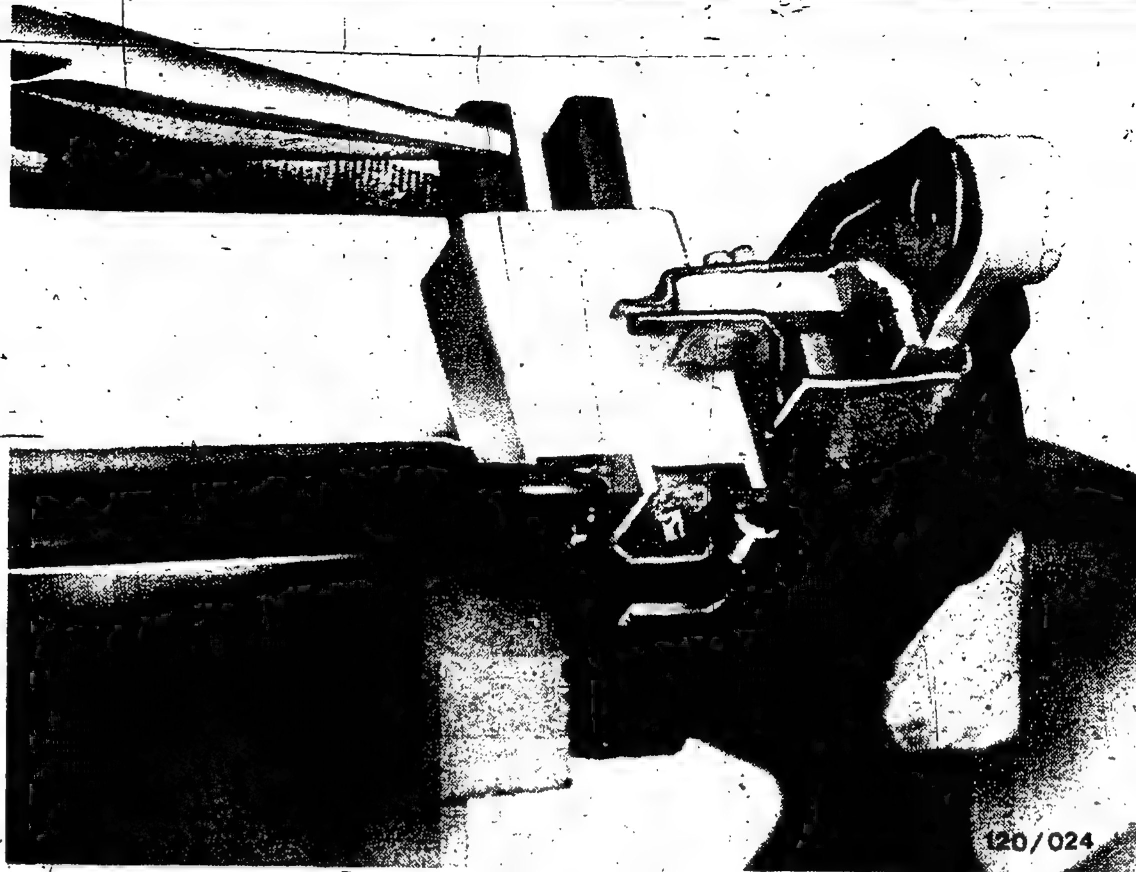
Tools

Soldering iron 180 W	commercially available
Riveting tool	KDLI 6017
Side-cutting pliers (blunt)	modified by user

Materials required

Soldering tin LSN 60	commercially available
Carbon-brush set for collector ring Ø 32 mm	1 127 014 019
Carbon-brush set for collector ring Ø 28 mm	1 127 014 018

4 15



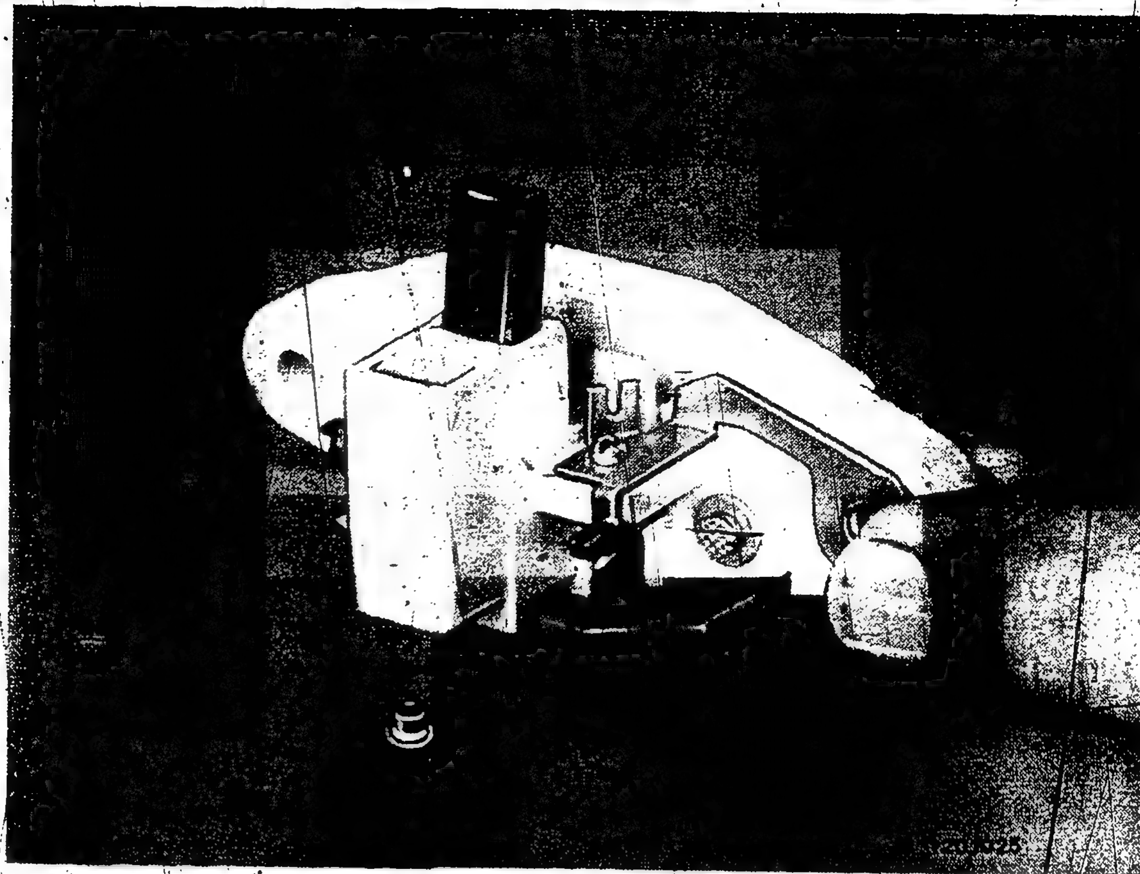
Changing the carbon brushes

Minimum projection of the carbon brushes = 5 mm

Removal

Using a 180W soldering iron, heat up the connecting wire whilst at the same time pulling the carbon brush out of the holder with flat pointed pliers.
Drill out the hollow rivet inside the brush-holder tube with a 3.2 mm dia. drill. Remove the remaining solder.

K16



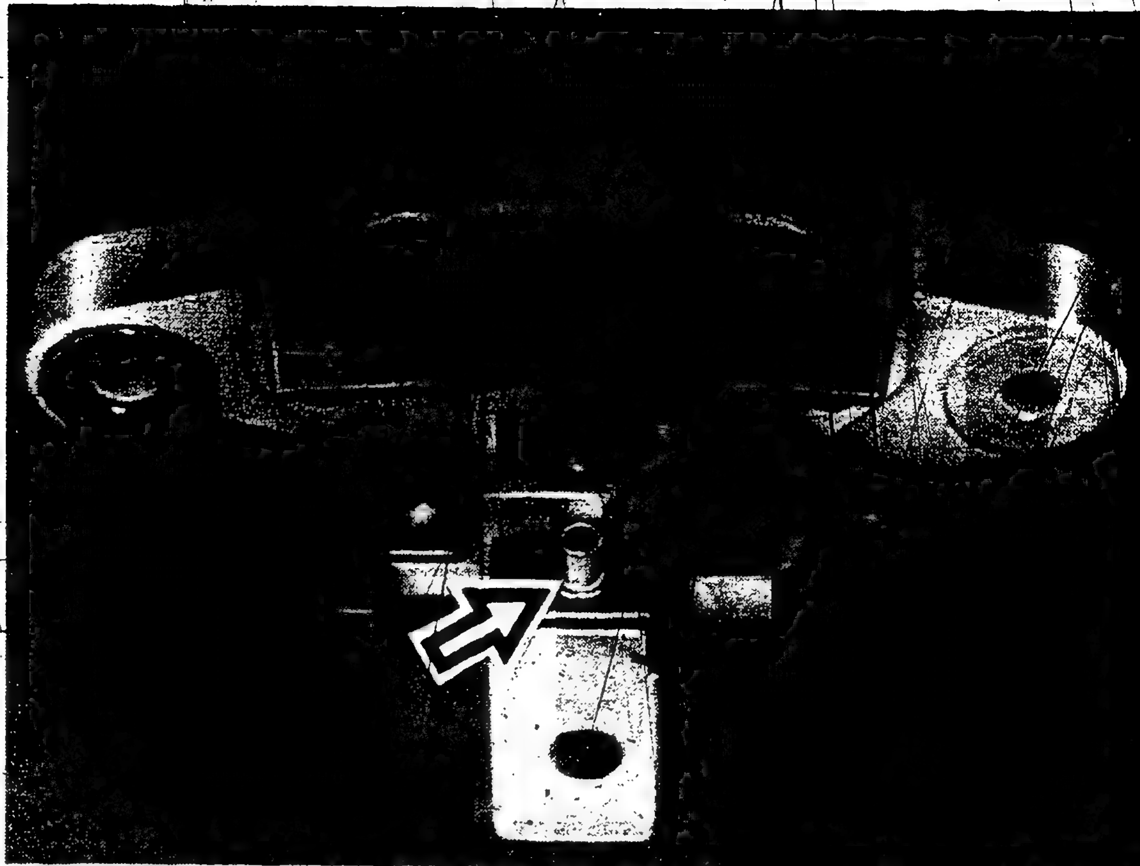
Fitting new carbon brushe

Place a new hollow rivet in the rivetting tool KDLJ 6017/0/1 (Fig.) and rivet it into the current bar using KDLJ 6017/0/2.

Carbon-brush set for 32 mm dia. collector ring
part number 1 127 014 019

for 28 mm dia. collector ring
part number 1 127 014 018

K. 17



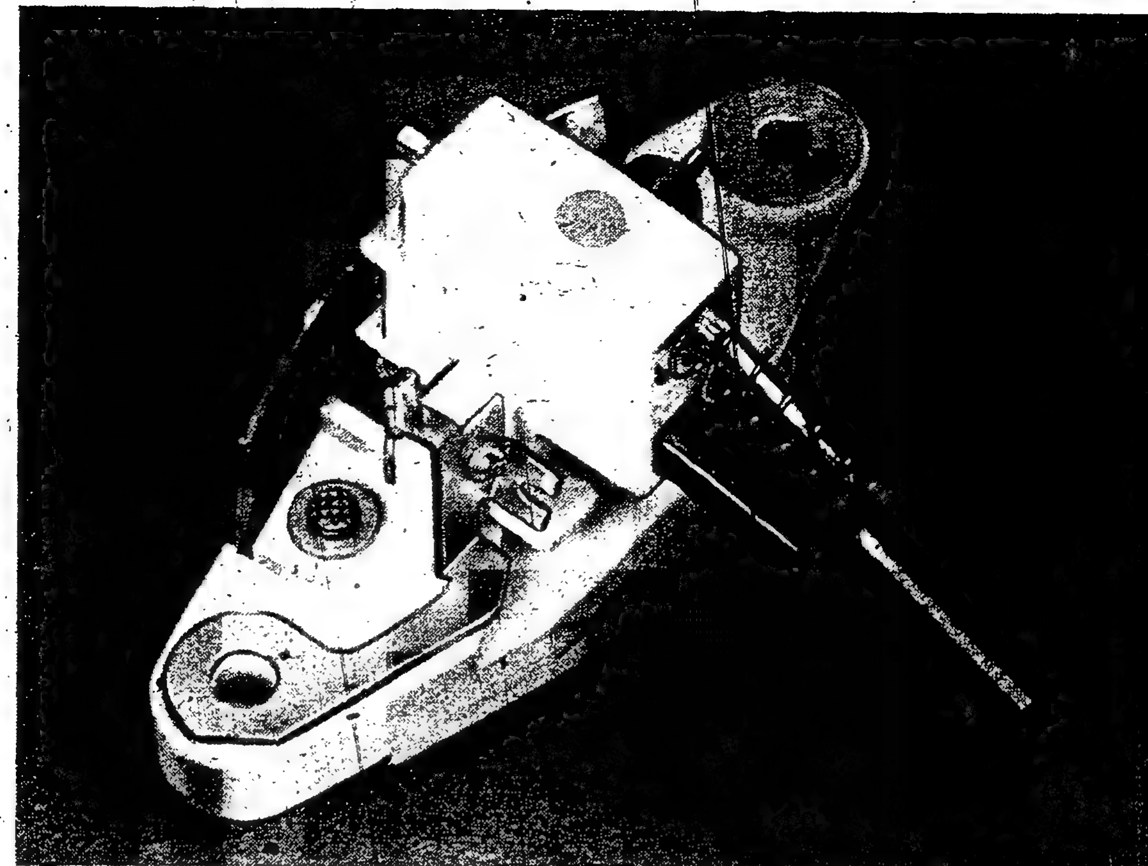
View from the other side:

The hollow rivet has been rivetted to the current bar (arrow).

4 18

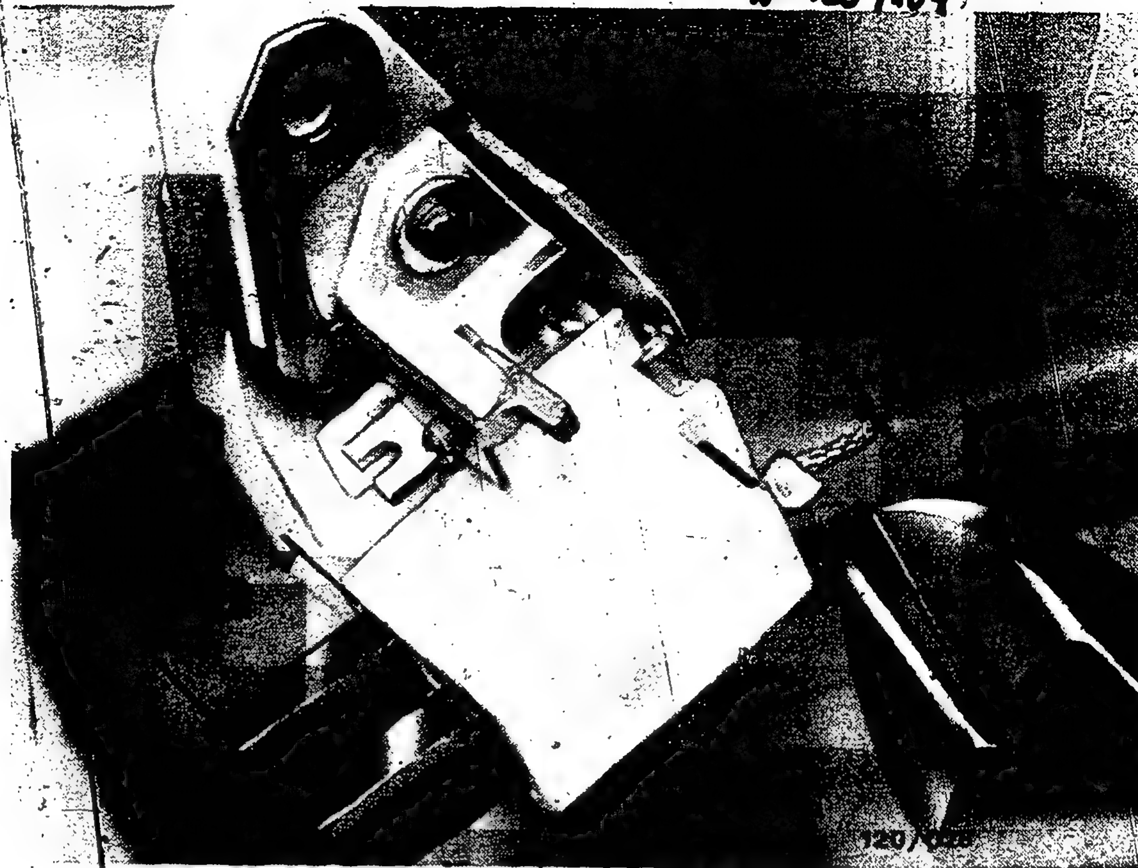
K18

Changing the carbon brushes Transistor regulator EL 14 V 1 197 311	



Fit the new carbon brush, with spring, in the holder in such a manner that the carbon brush is inclined towards the regulator housing (Fig.).

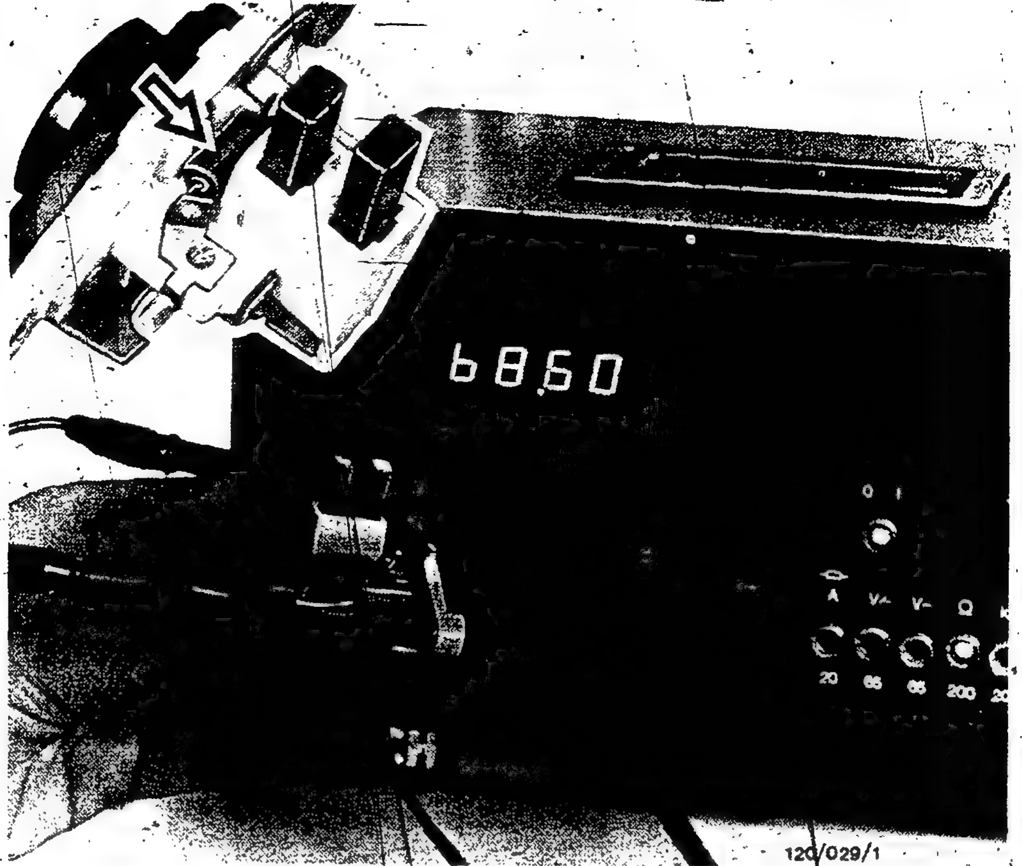
4.19



Carbon-brush projection (a)

for 28 mm dia. collector rings 12 ... 13 mm
for 32 mm dia. collector rings 11 ... 12 mm

After having set the projection (a), crimp the brush connecting wire into the hollow rivet. Use blunt (ground-down) side-cutters for this purpose. After crimping, solder the wire and the rivet together.
Cut off wire which protrudes from the rivet.



120/029/1

Testing the resistor

In some models of the EL-regulator, there is a resistor fitted between D+ and D- (arrow). If an open-circuit occurs in the DF-circuit, the charge indicator lamp lights up.

Testing

Unsolder the resistor at one of the lugs and bend up the resistor wire.
Connect the ohmmeter (as in the Figure) and measure the resistance.

Resistance: 64 ... 72 Ω

If the resistor is defective, replace it.

4 21

After-sales Service Instructions

Testing

12

VDT-W-120/300 En
Ed. 2

Unidirectional-breakdown diodes (Z-diodes)

1 127 328 000, .. 001

BOSCH After-sales Service
Automotive
Equipment

K22

This publication has been redesigned with the forthcoming change-over to microfilm in mind.

When a publication has been transferred to microfilm, the screen will be filled completely by a quarter of a printed publication page. For this reason it is unavoidable that illustrations are repeated in the case of longer texts in which reference is constantly being made to a particular illustration.

Until the change-over to microfilm, we have slightly reduced the size of the print and of the illustrations.

Automotive Equipment - After-sales Service
Department for Technical Publications KH/VDT
Postfach 50, D-7000 Stuttgart 1

Published by: After-sales Service
Department for Training and Technology (KH/VSK)
Please direct questions and comments concerning the contents to our authorized representative in your country.

Printed in the Federal Republic of Germany.
Imprimé en République Féderale d'Allemagne
par Robert Bosch GmbH.
(4.80)

K23

4 23

Necessary test equipment

Generator test stand	
Motortester	e.g. MOT 002.00 0 684 000 200
Voltage stabilizer with current limitation	commercially available
Voltmeter	commercially available
Ammeter	commercially available
Resistor 10Ω 5 W	commercially available

2

4 24

K24

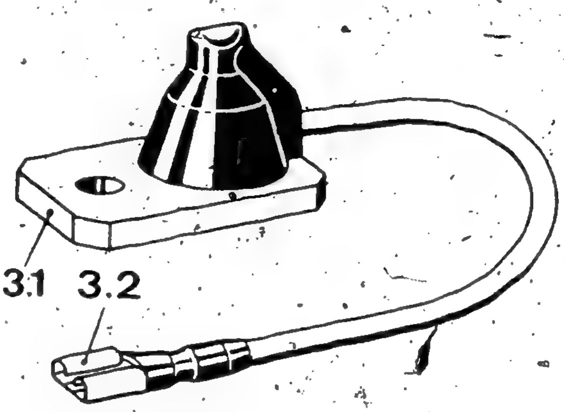


Fig. 1 Z-diode
3.1 Heat sink (anode)
3.2 Connector (cathode)

General

Z-diodes can be fitted or are already fitted in alternators in commercial vehicles, tractors, construction machines or assemblies of equipment, as alternator protection.

This Z-diode can be destroyed if the battery is wrongly connected or if there are other faults in the system.

The removed Z-diode can be tested with the voltage stabilizer, the fitted Z-diode can be tested on the generator test stand.

Before testing, check that the cable insulation of the Z-diode is not damaged.

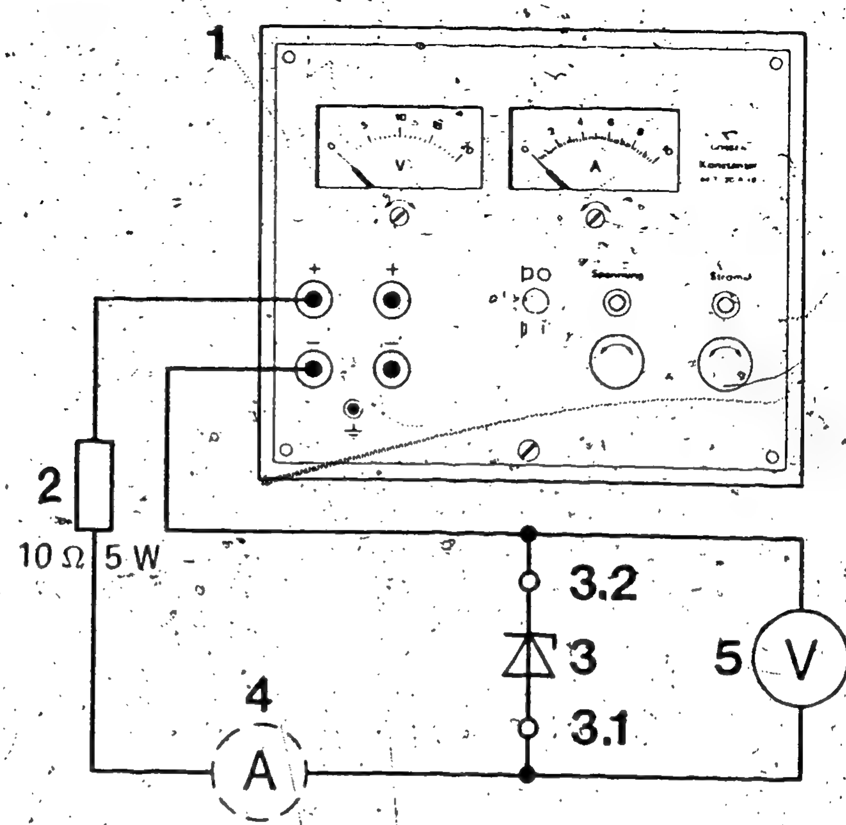


Fig. 2 1 Voltage stabilizer
2 Resistor 10Ω 5 W
3 Z-diode
3.1 heat sink (anode)
3.2 Connector (cathode)
4 Ammeter
5 Voltmeter

Functional test with the voltage stabilizer

Forward direction

Connect the Z-diode with resistor and voltmeter to the voltage stabilizer as shown in diagram 2.

Voltage at the voltage stabilizer	6.0 V
Current at the voltage stabilizer	0.5 A
Voltage at the voltmeter in circuit	1.0 V

Switch off the voltage stabilizer and turn the voltage and current knobs to 0.

PS. If the scale range on the ammeter of the voltage stabilizer is too large, then connect an additional ammeter in series to the resistor in the circuit.

K26

k 26

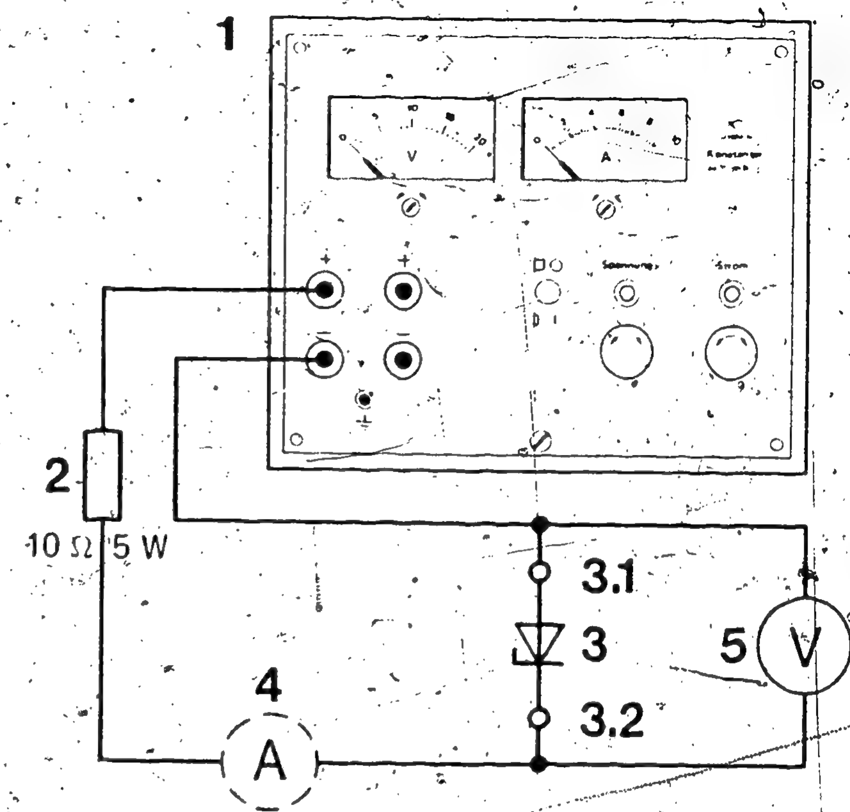


Fig. 3 Voltage stabilizer
2 Resistor 10Ω 5 W
3 Z-diode
3.1 Heat sink (anode)
3.2 Connector (cathode)
4 Ammeter
5 Voltmeter

Reverse direction

Short circuit the voltage stabilizer and set the current regulator to 0.5 A.
Remove the short circuit and switch off the voltage stabilizer. In doing so do not alter the setting of the current regulator. Connect the Z-diode to the voltage stabilizer as shown in the test circuit Fig. 3. Slowly increase the voltage with the voltage control. If the ammeter does not show any flow of current at 18 V and if the current is 0.5 A between 20 and 24 V, then the Z-diode is in working order.

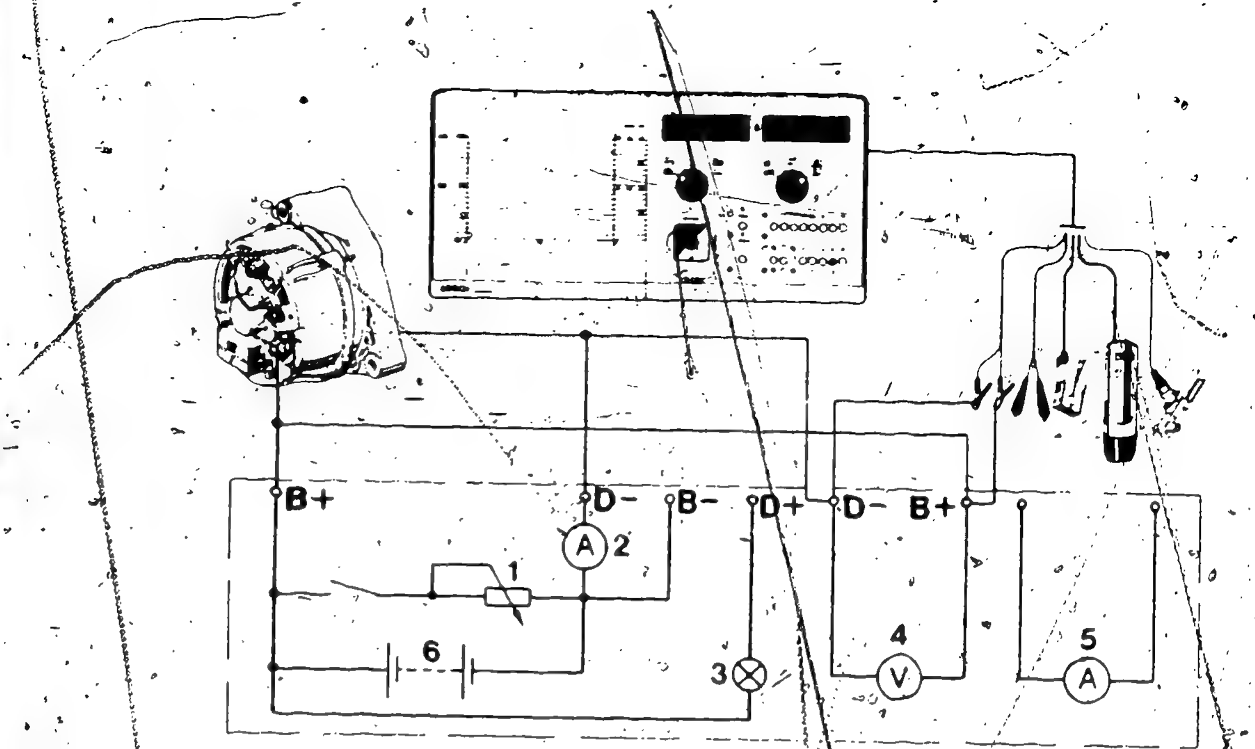


Fig. 4 1 Loading resistor
2 Ammeter
3 Control lamp
4 Voltmeter (regulated voltage)
5 Ammeter
6 Test stand battery

Functional test on the generator test stand

Clamp the generator with the fitted Z-diode to the generator test stand and connect the oscilloscope (red clip to B+, black clip to D-). Test circuit Fig 4.

Connect the anode (heat sink) of the Z-diode to D- and the cathode (connecting cable) of the Z-diode to B+.

Drive the generator at 6000 min^{-1}. Disconnect the battery and set the generator current to the current specified on generator nameplate, at the most however, to 35 A.

K28

N-1201300

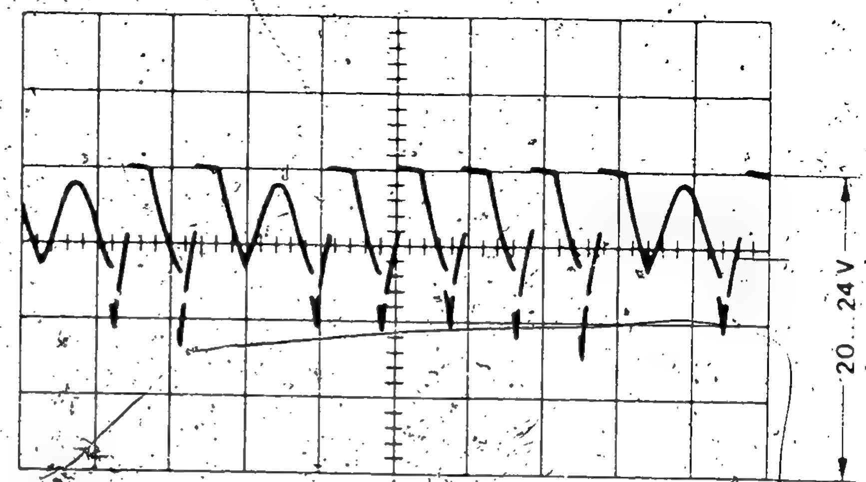


Fig. 5

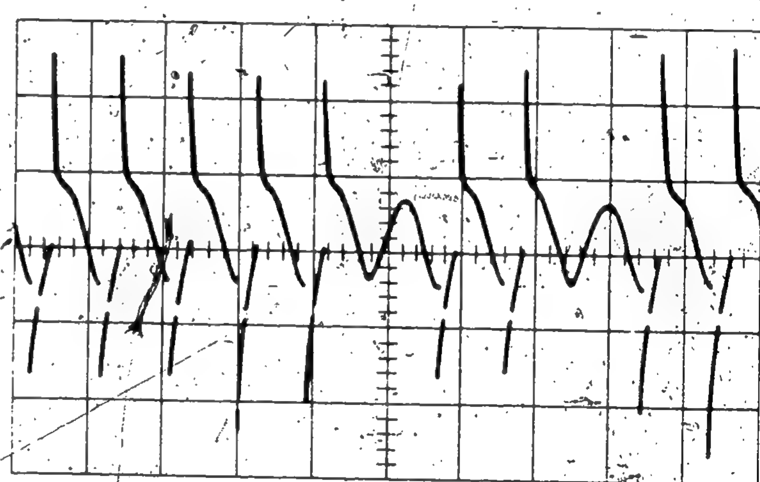


Fig. 6

Temporarily switch off the generator current by unscrew-ing the B+ connection or with the EFLJ 70 A test stand by switching off the positive supply.
Whilst B+ is switched off, the oscilloscope must show a display similar to that in Fig. 5.
Fig. 6 shows the oscillogram of a defective Z-diode. (open circuit). When the Z-diode is short-circuited to ground the generator is not excited.

L1

L 1

ATTACHED-TYPE TRANSISTOR REGULATOR EE..V 3 VDT-I-120/114 En

0 192 052 ..., 0 192 053 ..., testing 9.1980

In the past difficulties have occurred occasionally when testing the above-named attached-type regulator.

When testing on the generator test bench in accordance with Test Instructions VDT-W-192/301 functional defects occurred briefly, in the form of regulated-voltage variations, which could not be identified with absolute certainty.

Due to technical modifications carried out on these regulators since date of manufacture 041 (Jan. 1980), these defects have been eliminated.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

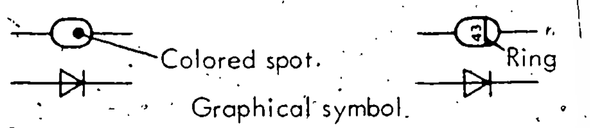
VDT-1-270/100 B

3. 1976

0 270 000..
Cast-resin-enclosed silicon diodes
(Conducting state current 1 A).

The versatile and very often used 1 A cast-resin-enclosed diodes receive by way of differentiation colored spots or rings which give information concerning technical data. The marking is always to be found on the cathode side:

Further details can be seen from the comparison table below.



1 A cast-resin-enclosed diodes 0 270 000 001 up to ..017

Col. spot	Part Number 0 270 000..	Deliv. form	Dia. mm	Reverse voltage V	Reverse current A	Special characteristics	Application
white	001 007 010 012	single single strip*) strip*)	6 4.5 6 4.5	100	100		exciter diode in alternators general use (e.g. free-running diode)
yellow	002	single	6	100	100	"quick" diode: switching time max. 0.5 µs	transistor regulator, TCI trigger box
green	003	single	6	400	200	"quick" diode: switching time max. 0.5 µs good blocking properties	charging diode CDI, TCI trigger box, free-running diode
blue	009 017	single strip*)	6 6	200 200	50 50		exciter diode in 28 V generators.
brown	014	strip*)	6	350	50	good blocking properties	exciter diode in alternators in operation without battery
red	015	single	6	100	100	extended electrical data	temperature compensation diode in transistor regulators
orange	016		6	400	100	good blocking properties	protective diode for TCI trigger box
white ring	e.g. 010	further identification e.g.:				434 internal works designation	10 Part No ...010

* For use in manufacturing machinery.

BOSCH Geschäftsbereich KH Kundendienst Kfz Ausrüstung
by Robert Bosch GmbH D-7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

L3

L 3

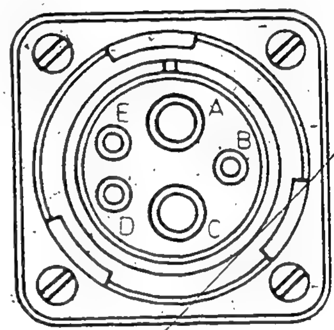
Depending upon their power rating, T-type alternators are equipped with different multi-pole sockets with different terminal connections.
In the following, T-type alternators are listed together with the relevant terminal identification and a drawing showing the mating plug. The addresses of the manufacturers concerned are given at the end of each list.

Alternator 0 120 689 504   T1-28V95A16

Socket terminal identification

A = D-
B = D+
C = B+
D = W
E = Vacant

Mating plug: Litton Co.
D-24-12 SN-VG 95235

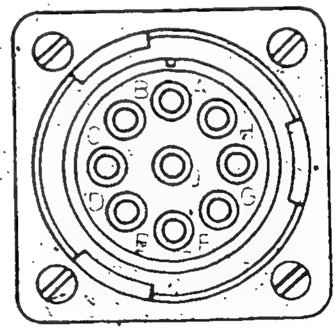


Alternator 0 120 600 572   T1-28V85A16

Socket terminal identification

A = B+
B = D-
C = DF1
D = DF2
E = U-phase
F = W-phase
G = V-phase
H =
J = Bridged

Mating plug: Litton Co.
H-20A9PN-VG 95234



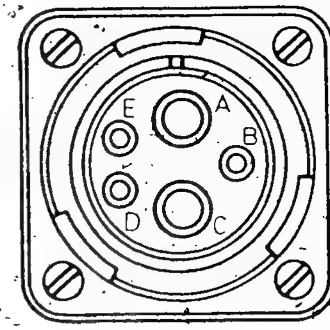
L 4

Alternator 0 120 600 574   T1-28V85A14

Socket terminal identification

A = D-
B = D+
C = B+
D = D-
E = DF

Mating plug: Litton Co.
D-24-12 SN-VG 95235

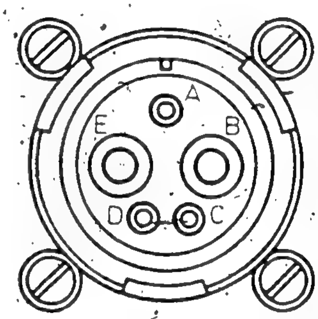


Alternator 0 120 600 577   T1-28V125A21

Socket terminal identification

A = D-
B = D-
C = DF
D = D+
E = B+

Mating plug: Litton Co.
D-32-1 SN-VG 95284

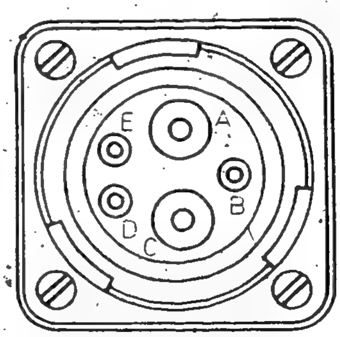


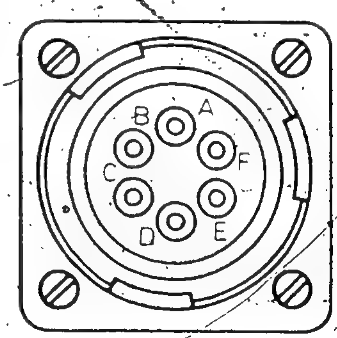
Alternator 0 120 600 589   T1-84V31A15

Socket terminal identification

A = D+
B = D-
C = DF1
D = DF2
E = S
F = Ground

A = D-
B. = -
C = B+
D = -
E = -



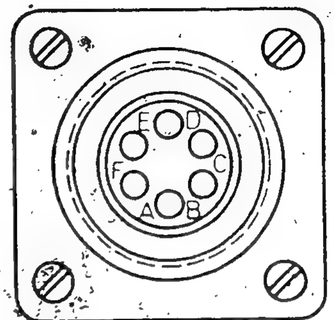


Mating plug: Litton Co.
5-pole D-24-12SN-VG 95234
6-pole D-14-S-6 PN-VG 95234

L5

L 5

Alternator 0 121 600 502 T2-28V85A12
0 121 600 503 T2-28V85A12
0 121 600 505 T2-28V85A12
0 121 600 506 T2-28V85A12
0 121 600 507 T2-28V85A12
0 121 600 508 T2-28V85A12

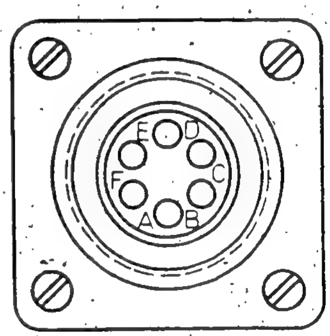


Socket terminal identification

A = D+
B = D-
C = DF
D = -
E = -
F = B+

Mating plug: Cannon Co.
CA 06 EA 14 S-6 P

Alternator 0 121 600 509 T2-28V100A12

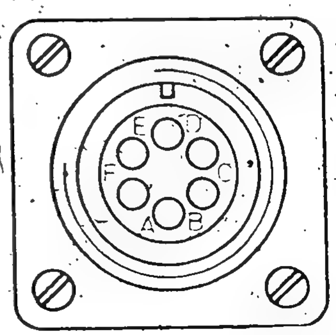


Socket terminal identification

A = D+
B = D-
C = DF
D = D-
E = D+
F = B+

Mating plug: Cannon Co.
CA 06 EA 14 S-6 P

Alternator 0 121 600 513 T2-28V100A12



Socket terminal identification

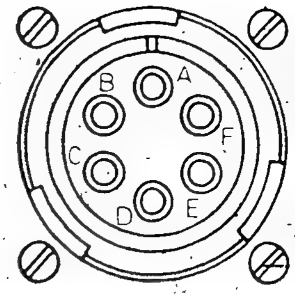
A = D+
B = D-
C = DF
D = D-
E = D+
F = B+

Mating plug: Cannon Co.
CA 06 EA 14 S-6 P

Alternator 0 121 600 514 T2-28V170A16
0 121 600 518 T2-28V170A16

Socket terminal identification

A = D+
B = D-
C = DF1
D = DF2
E = D+
F = B+



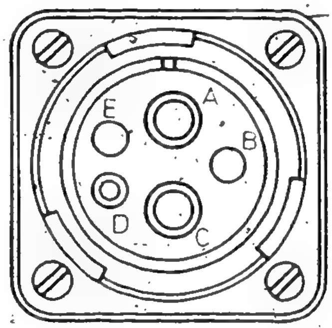
Mating plug: Litton Co.
D-14S-6PN-VG 95235

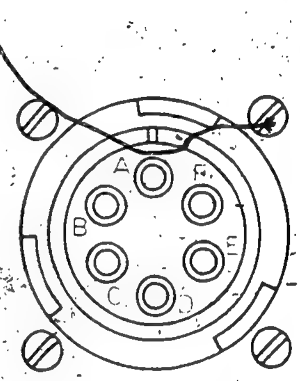
Alternator 0 121 600 515 T2-28V170A16

Socket terminal identification

A = D+
B = D-
C = DF1
D = DF2
E = D+
F = B+

A = B+
B = -
C = B+
D = W-phase
E = -



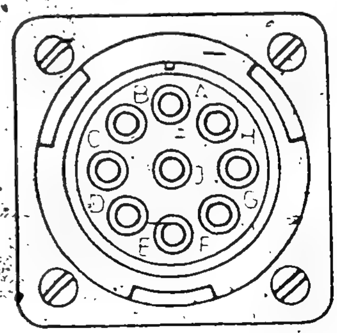


Mating plug: Litton Co.
5-pole D-24-12SN-VG 95235
6-pole D-14S-6PN-VG 95235

Alternator 0 122 600 001 T3-28V180A28

Socket terminal identification

A = B+
B = D-
C = DF1
D = DF2
E = U-phase
F = W-phase
G = V-phase
H = } Temperature-dependent resistor
J = }



Mating plug: Litton Co.
H-20A9PN-VG 95234

Addresses of the mating-plug manufacturers:

Litton Co:	Veam Elektro-Anschlusstechnik GmbH Scharnhäeuser Straße 3 D-7024 Filderstadt 1 Tel. (0049711) 70 20 21/22 Telex 7-255430
Cannon Co.	CANNON ELEKTRIC GMBH Postfach 1120 D-7056 Weinstadt Tel. (07151) 6 80 31 Telex 7262022

BOSCH

TEST INSTRUCTIONS

12

VDT-WPE 315/101 B
Ed. 1

Supersedes VDT-WPE 315/1 B
and 315/2 B

Alternators

L9

Contents

1. Explanation of type designation code

K 1 ( ) 14 V 35 A 20

- 20 — Speed (rev/min) in hundreds at 2/3 maximum current (nominal-output speed)
- 35 A — Maximum current in amperes
- 14 V — Alternator voltage in volts
- ( ) — Direction of rotation ↔ or RL clockwise or counterclockwise rotation respectively
- 1 —
  1 Claw-pole alternator
  2 Single-pole alternator
  3 Permeable-rotor alternator
  4 Claw-pole alternator with exciter
- K — Diameter of stator frame

G	100	109 mm		Q	140	169 mm
J	110	119 mm		T	170	199 mm
K	120	139 mm		U	over 200 mm	

WPE 315/101

2. Test equipment and tools

Generator test bench	EFLJ 20 ..	0 680 110 ...
or	EFLJ 25 ..	0 680 110 ...
or	EFLJ 70 A	0 680 104 ...
or combination test bench (for loads up to a maximum of 43 A only)	EFAW 275 ..	0 681 107 ...
Universal clamping device	EFLJ 66/1	1 688 000 081
for mounting Types G 1 and K 1 alternators on test bench	EFLJ 20	
or	EFLJ 25	
Universal clamping device	EFLJ 66/1 S 10	1 688 000 137
for mounting Types G 1 and K 1 alternators on test bench	EFLJ 70 A	
Mounting plate	EFLJ 66/2	1 688 000 083
for clamping flange mounted alternators to test bench	EFLJ 20	
or	EFLJ 25	
and	EFLJ 70	
or		
Mounting plate	EFLJ 66/3	1 688 000 085
for clamping swivel-arm mounted alternators to test bench	EFLJ 20, 25, 70	
Set of parts		1 687 000 042
for clamping swivel-arm mounted alternators to combination test bench	EFAW 275 ..	
Alternator tester	EFAW 192	0 681 101 403

For additional testing or checking:

Ignition oscilloscope, for ex.	EFAW 206	0 681 102 ...
or	EFAW 213	0 681 102 ...
or		
Bosch Motortester (all models)		
Special pickup cable (for ignition oscilloscopes)	EFAW 206	1 684 460 004

L 11

3. General

3.1.
Alternators may be tested only with a suitable fan belt pulley on the generator test bench.

3.2.
In order to supplement the testing, an ignition oscilloscope can also be connected.

3.3.
Diodes and windings are tested with Alternator Tester EFAW 192.

3.4.
It is possible to check the alternator with an ignition oscilloscope without removing it from the vehicle. This check can be used to detect all defects in the rectifier section and in the stator windings but not in the rotor.

3.5.
If insulation tests or tests for short-circuit to ground are carried out with voltages above 24 V, the diodes must first be disconnected.

Fig. 1

1 = Alternator side
For alternators with blade terminals
Blade connector 1 194 485 402
For alternators with pin terminals
Pin connector 0 352 330 002

2 = Regulator side
For regulators with 3 blade terminals
Blade connector 1 194 485 402
For regulators with 4 blade terminals
Blade connector 1 194 485 404

3 = Connector cable 3 x 1.5 □

4. Testing alternator on test bench

4.1. Mounting alternator on test bench

Use only suitable clamps when mounting hinge-mounted or flange-mounted alternators on the test bench.

4.2. Connecting alternator on test bench.

Note:
Older test benches without a built-in charge indicator lamp must be modified in accordance with VDT-WUF 113/4 B.

Connect the plus battery line of the test bench to B+ of the alternator. In the case of alternators with an insulated return line, connect the minus battery line of the test bench to B− of the alternator.

If the clamping table on the test bench is used as a ground line, be sure that no contact resistances develop. For this reason, when testing higher-power alternators it is advisable to connect the minus battery line of the test bench directly to the alternator. Attach the voltmeter between B+ and D−.

Be especially sure that:
All connections on the test bench are made correctly. When the alternator is operating, the connection between the alternator and the battery must not be broken because this could result in destruction of the semiconductors in the alternator and regulator.

Do not operate the alternator without the battery connected.

If a direction of rotation is given on the fan belt pulley or on the alternator, the alternator should be driven in this direction only.

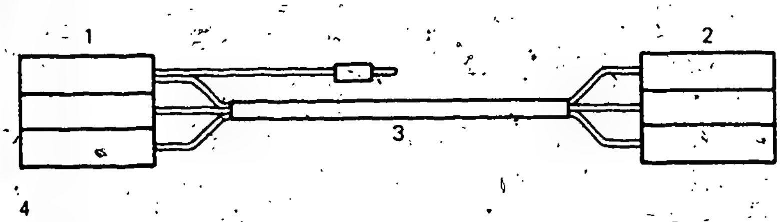
4.2.1. With regulator

Mount the contact (vibrating-type) regulator with its terminals downwards on the clamping board on the test bench.

A connector cable to run between the alternator and the regulator should be made locally according to Fig. 1 if necessary. The D+ line which is brought out connects to the charge indicator lamp. If the generator and regulator are fitted with Bendix plugs, plug connector 0 352 960 004 must be used.

4.2.2. Without regulator

Connect alternator terminals D+ and DF together. Connect the charge indicator lamp to D+.



4.3. Output test

Note:
When conducting the output test be sure that the protective resistor built into the test bench is not connected in the circuit because if it is, the charge indicator lamp will flicker and incorrectly indicate a defect in the alternator.

The alternator on the test bench is brought up to operating temperature for the test.

Select the following speeds for this purpose:

Types G and K alternators: 3,500 rev/min
Types T and U alternators: 2,000 rev/min.

Increase the load current above the maximum value until the voltage begins to drop.

If the alternator is tested without a regulator, readjust the load resistance continuously with the speed so that the voltage does not rise unacceptably high, that is, not much higher than the alternator voltage given.

When the alternator has reached a housing temperature of about 60° C the actual output test can be made.

4.3.1. Output test with regulator

First bring the alternator up to the testing speed (see Test Specifications Sheet VDT-WPE 315/201 B), then readjust the load resistor until the specified current is reached. The voltage shown must not be less than the alternator voltage.

4.3.2. Output test without regulator

Readjust the alternator speed and the load resistor so that the voltage shown is 1–2 volts above the alternator voltage (for example, 15–16 volts with a 14-volt alternator). When the testing speed has been reached, increase the load up to the required current. The voltage indicated may then not be less than the alternator voltage.

Example of Test:
Alternator K1 14 V 35 A 20

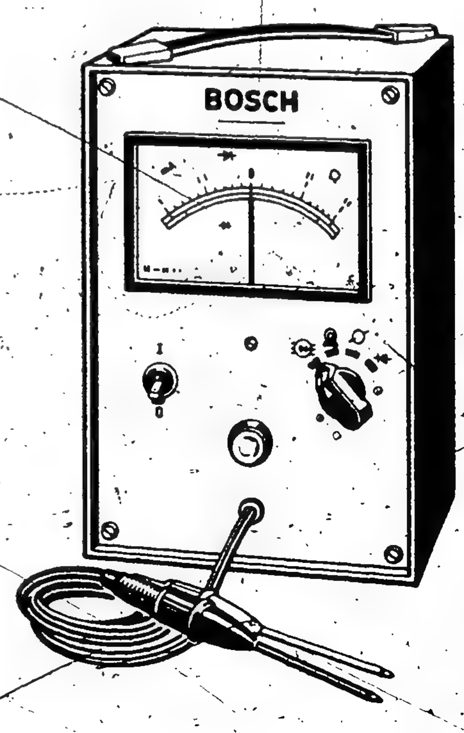
Alternator Speed (rev/min)	Load Current (minimum value) (A)
1300	10
2000	23
6000	35

Note:
If the drive power of the test bench motor is not sufficient at very high alternator outputs, continue the test only as long as the test speed does not drop at the required testing current.

During the output test the charge indicator lamp must remain completely out.

5. Testing individual parts with Alternator Tester EFAW 192

Fig. 2



The rectifier section and the stator and rotor windings of the alternator can be tested using Alternator Tester EFAW 192. This test is particularly applicable when:

1. the alternator has been disassembled for maintenance or repair,
2. the rated values were not reached during the output test, and
3. it must be determined which diodes have failed.

5.1. Meaning of Individual Switch Positions

Switch Position	To Test	Measurement Scale	Reading (Rated Values)	
	Forward conductance performance (for diodes connected in circuit and individual diodes see 5.2. below).	Volts	Needle deflection to right or left into green field.	The upper half of the scale applies for power diodes and for press-in excitation diodes. The lower half of the scale applies for excitation diodes in Types G and K alternators.
	Resistance of stator winding	2 Ω	See Test Specifications Sheet VDT-WPE 315/201 B.	
	Resistance of rotor winding	20 Ω	See Test Specifications Sheet VDT-WPE 315/201 B.	
	Dielectric strength (this test can only be made when the diode to be tested is disconnected from the stator winding).	mA	Forward direction: needle deflection to the left into the green field. Reverse direction: needle deflection up to a maximum of 0.8 mA.	

5.2. Test points (M)

Switch Position

Plus diodes — M and 1

Minus diodes — M and 2

Excitation diodes — M and 3

as shown by Fig. 3.

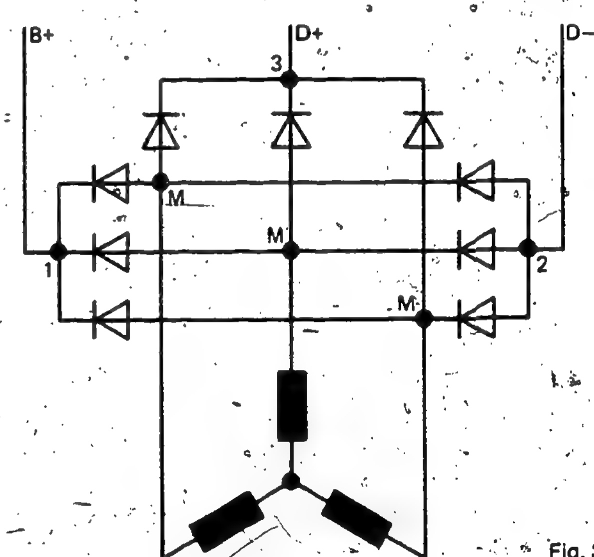


Fig. 3

Stator winding (Switch position)

The test points are the phase outlets. The diodes must not be connected during this measurement.

For resistance values see Test Specifications Sheet VDT-WPE 315/201 B.

Rotor winding (Switch position)

Place the test probes directly on the collector ring. Be sure good contact is made.

For resistance values see Test Specifications Sheet VDT-WPE 315/201 B.

5.3. Additional tests on type T 4 alternator

5.3.1. Rectifier in rotor

Switch position

Measure from the 3 common points to the outer and inner rings.

Needle deflection to the right or left into the green field in the lower half of the scale.

Outer ring:	1
Inner ring:	2
Excitation winding:	3
Common points:	4

Before the test clean off the test points until the bare metal shows.

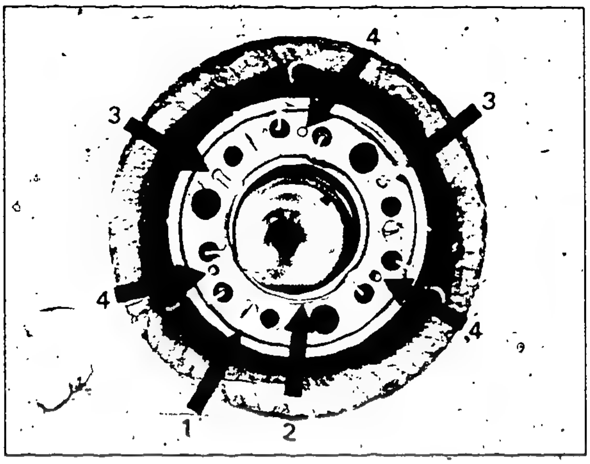


Fig. 4

5.3.2. Excitation winding in stator frame

Switch Position ∅

Place test probes at D+ and DF as shown in Fig. 5.

For resistance values see Test Specifications Sheet VDT-WPE 315/201 B.

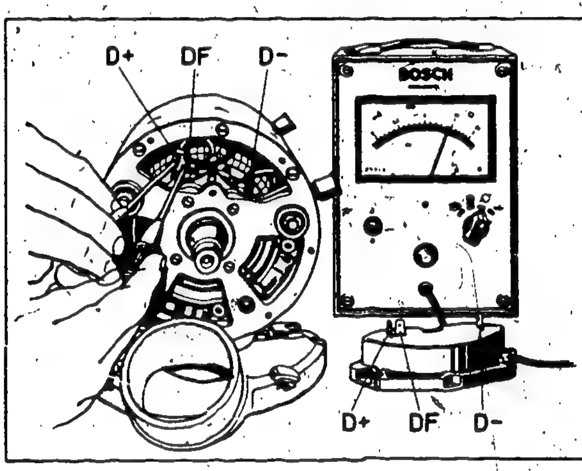


Fig. 5

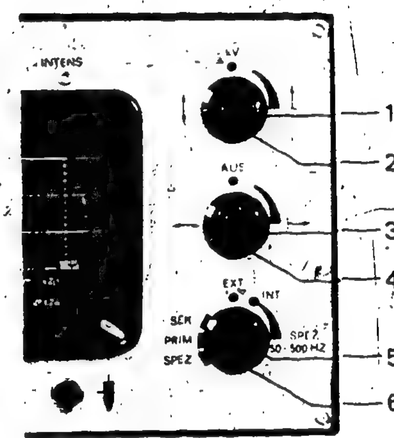
6. Testing the alternator in the vehicle Supplementing the output test with the ignition oscilloscope

6.1. Connecting the oscilloscope

The oscilloscope is connected to the alternator by the test cable provided, with the red clip attached to alternator terminal D+ and the black clip attached to D− (ground).

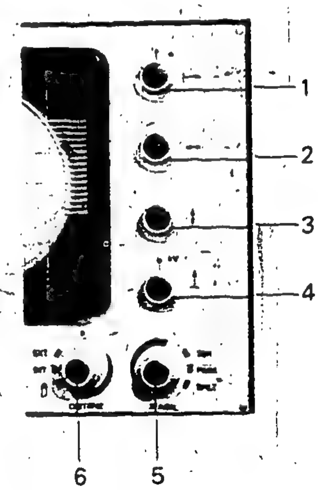
6.2. Adjusting the oscilloscope

6.2.1. EFAW 206.. and Motortester EFAW 170.. and EFAW 171..



1 = Fine control of oscillogram height turn about 90°
2 = Vertical control (coarse), adjust so that oscillogram base is about on the 10 kV line
3 = On-off switch and oscillogram width control, turn about 90°
4 = Horizontal control
5 = Synchronization (oscillogram stability)
6 = Test mode switch set to "Spezial" ("Special").

6.2.2. EFAW 213.. and Motortester EFAW 214..



1 = On-off switch and oscillogram width control, turn about 90°
2 = Horizontal position control
3 = Vertical position control set so that the base line of the oscillogram is at about the 10-kV line
4 = Oscillogram height control
5 = Test mode switch set to "Spezial" Oscillogram stabilization = small knob
6 = Synchronization switch set to "Intern".

6.3. Test procedure

Note for use of EFAW 206, 170, and 171:

With an alternator that is in proper operating condition, the oscillogram is only stabilized when synchronization is applied. In order to recognize defects, however, the connection with the test cable alone suffices because defects in the alternator – rectifiers automatically cause oscillogram stabilization.

6.3.1. Alternator mounted on engine

Start the engine and let it run at about 1,000 rev/min, then load the alternator by turning on the headlights.

6.3.2. Alternator on test bench

Drive the alternator at 2,000 rev/min and load it by switching in the load resistor.

WPE 3451401

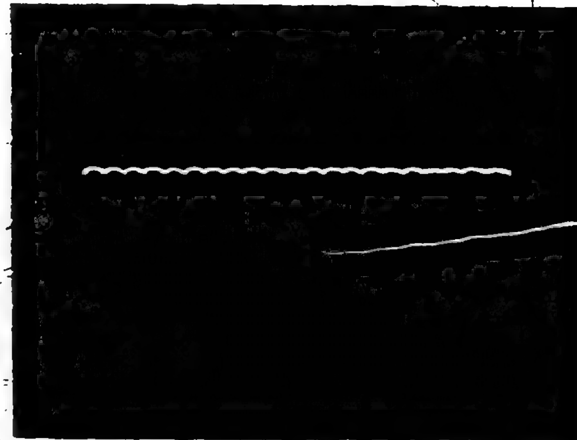
6.4. Evaluating oscillograms

6.4.1. Oscillogram from an alternator that is operating perfectly

This oscillogram is from an alternator that is operating perfectly. The DC voltage generated has a small harmonic component. Small spikes can be superimposed on the oscillogram shown if the alternator regulator is operating. By switching in a load (for example, when the headlights are switched on) the regulator can be "shut down".

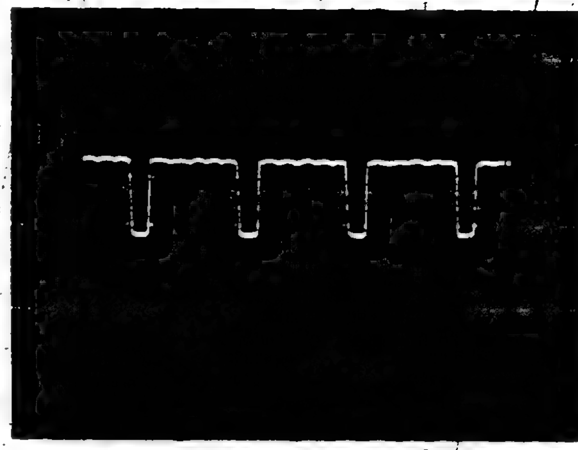
Moreover, additional small spikes can be produced as a result of stray pickup from the ignition system.

Adjust the oscillogram height so that the harmonic ripple is located between two kV lines.

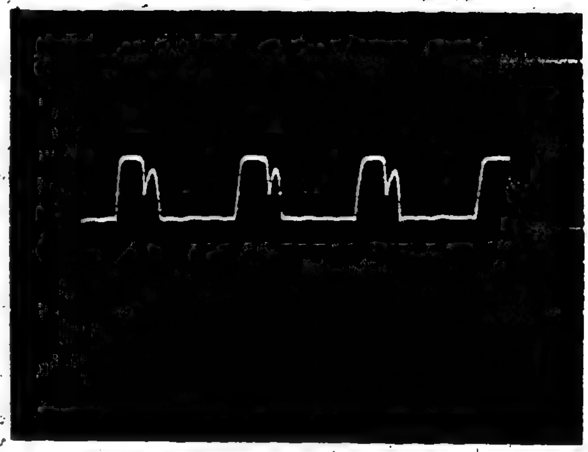


6.4.2. Possible defects

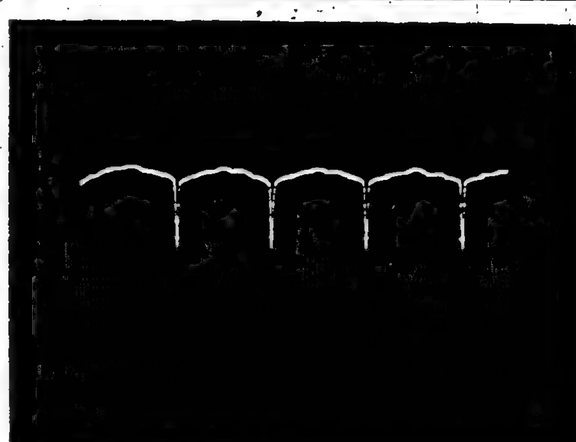
In order to be able to compare such oscillograms, each oscillogram should be adjusted by using the vertical position control on the oscilloscope so that it fits approximately between the 10- and 20-kV lines.



Excitation diode open

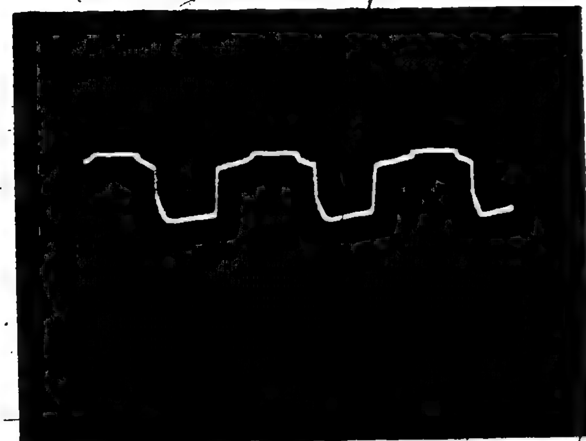


Plus diode open

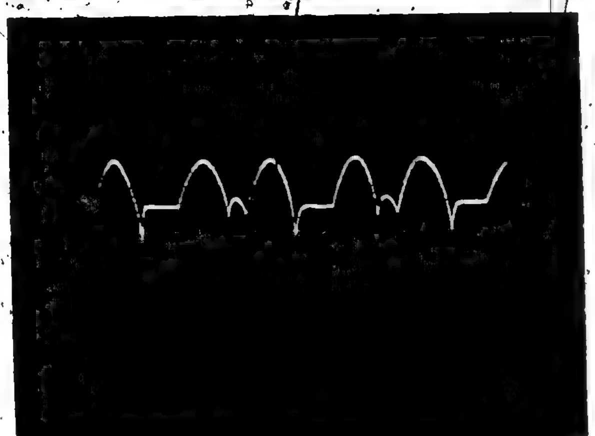


Minus diode open

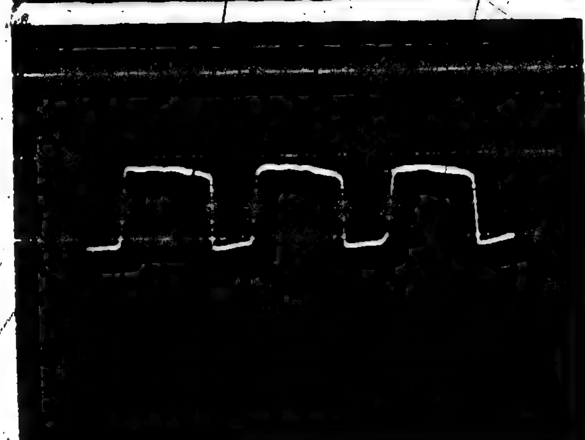
L17



Excitation diode short-circuited



Plus diode short-circuited



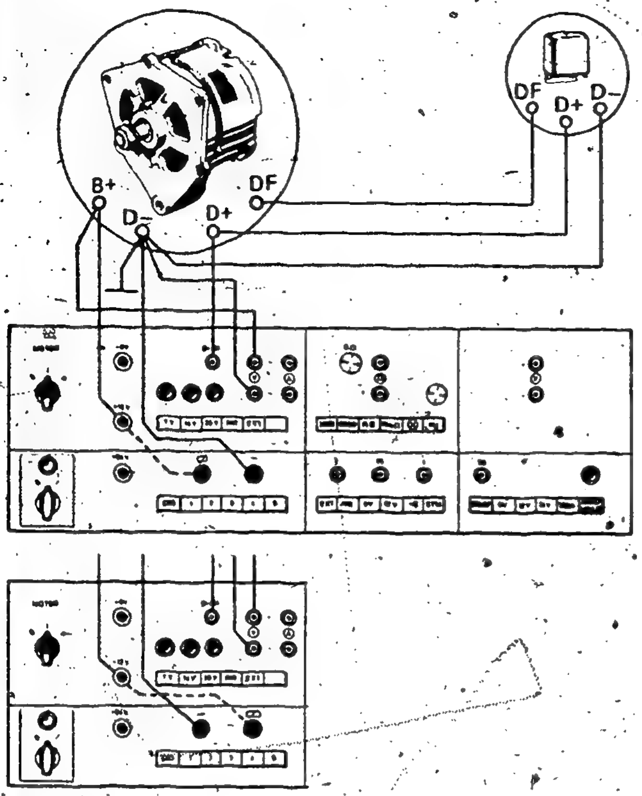
Minus diode short-circuited

Phase defect (open circuit)

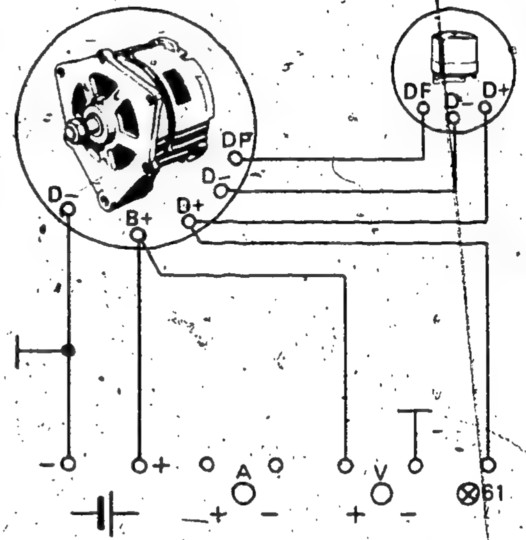
Note:
Several defects can also occur together.

7. Connections on Generator Test Bench

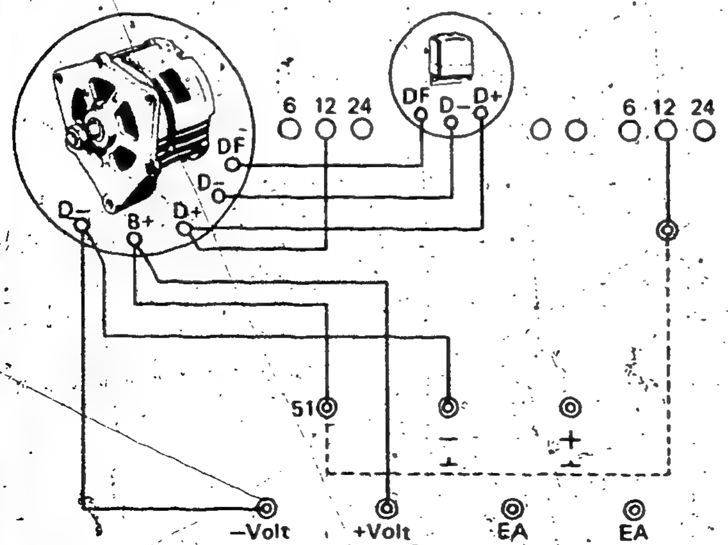
(Only for alternators with − ve ground)



Connection diagram for EFAW 275 A



Connection diagram for EFLJ 70 A



Connection diagram for EFLJ 20../EFLJ 25..

CHANGEOVER TO M5 ANTI-FATIGUE THROUGH BOLTS WITHOUT PLAIN WASHERS IN ALTERNATORS

VDT-I-120/112 En

3.1980

G 1, K 1, N 1

0 120 ... alternators

Since the beginning of 1980 plain washers and spring lock washers are not used any more in alternators with M 5 anti-fatigue through bolts. This has resulted in certain changes in measurement which must be taken into account when repairing these alternators.

When anti-fatigue through bolts are used between drive-end-bearing housing and collector-ring end shield, plain washers and spring lock washers can be dispensed with under two conditions:

- The seating surface of the screw head in the drive-end-bearing housing must be big enough. To increase the seating surface the screw head has been increased in diameter from 9 to 10 mm.
- The tightening torque for the anti-fatigue through bolts must be 4 ... 5 Nm.

The countersinking in the drive-end-bearing housing has been reduced by 1 mm in depth.

The new anti-fatigue through bolts will be delivered with the same part number and can be used with existing drive-end-bearing housings without washers and spring lock washers.

The existing anti-fatigue through bolts with a screw-head diameter of 9 mm must have a washer mounted on them in order to increase the seating surface. The spring lock washer can be dispensed with here as well.

At all costs care must be taken to see that the fan does not brush against the screw head, especially when existing anti-fatigue through bolts with plain washers are fitted together with a new drive-end-bearing housing. If necessary use new anti-fatigue through bolts without plain washers.

This changeover does not apply to alternators with M 6 anti-fatigue through bolts. In this case a plain washer is still required.

NAMEPLATES FOR ALTERNATORS G1 and K1

Not all of the nameplates for G1 and K1 alternators are given in the service part lists. Difficulties have therefore arisen in the After-sales Service Centers when new nameplates have been needed after repair work.
From now on you can order the nameplates listed in the table below in packs of 10 for DM 2,-. The minimum charge for orders is DM 20,-.

Orders should be sent to:

Robert Bosch GmbH
Abt. KH/VKD 4
Postfach 50
D-7000 Stuttgart 1

or to:

Fa. Reinhold Mack
Jahnstr. 144
D-7320 Göppingen/Württ.

Alternator	Nameplate	Alternator	Nameplate
0 120 300 519	1 121 102 119	0 120 400 790	1 121 102 490
535	135	791	491
552	152	805	505
		830	530
0 120 339 514	714	848	548
518	718	875	575
531	731	876	576
536	734	877	577
		882	582
0 120 340 005	103	887	587
		894	594
0 120 400 600	000	933	933
606	006		
637	037	0 120 489 501	201
640	040	520	220
700	400	522	222
712	412	526	226
719	419	527	227
722	422	532	232
757	457	547	247
774	474	548	248
788	488	556	256

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung
by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

L 21

L 21

Alternator	Nameplate
0 120 489 557	1 121 102 257
558	258
559	259
560	260
566	266
568	268
588	288
590	290
593	293
614	1 121 103 014
616	016
617	017
619	019
622	022
623	023
628	028
630	030
632	032
654	054
657	057
667	067
686	086
688	088
714	114
720	120
739	139
741	141
745	145
747	147

L22

L22

K1-ALTERNATORS 0 120 489..

Fitting of terminal "W"

General

In order to fit a tachometer in vehicles with a diesel engine, it is necessary that the alternator has a connection "W".

K1-alternators (0 120 489..) with integral voltage regulator, which are not provided with the "W" connection are to be retrofitted using the parts set 1 127 011 062.

Procedure

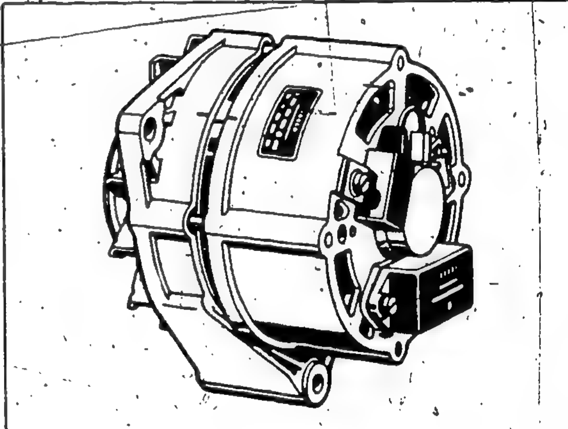
Remove the alternator. Mark the positions of the drive end shield, stator, and collector-ring end shield. This is necessary for re-assembly (Fig. 1).

Unscrew the fitted regulator and remove it carefully.

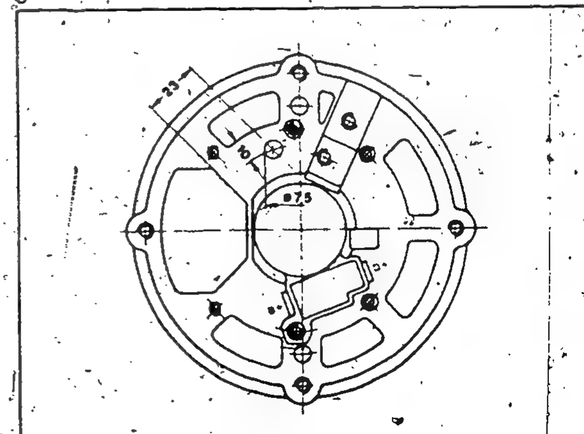
Unscrew the fastening screws in the drive end shield. Remove the drive end shield, together with the rotor, from the stator and the collector-ring end shield.

Unscrew the rectifier plate from the collector-ring end shield. Remove the stator, together with the rectifier plate, from the collector-ring end shield.

Drill a 7.5 mm dia. hole in the collector-ring end shield as shown in Fig. 2. Deburr the hole



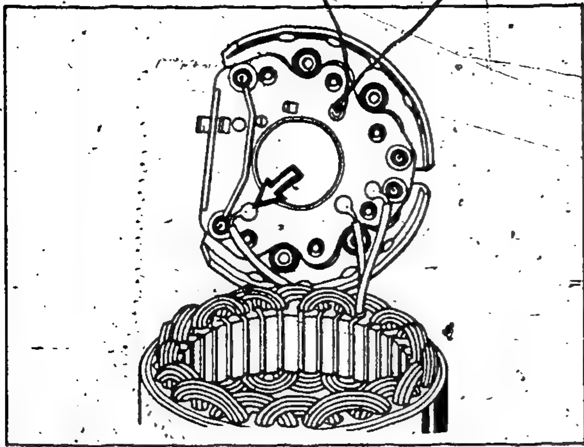
1



2

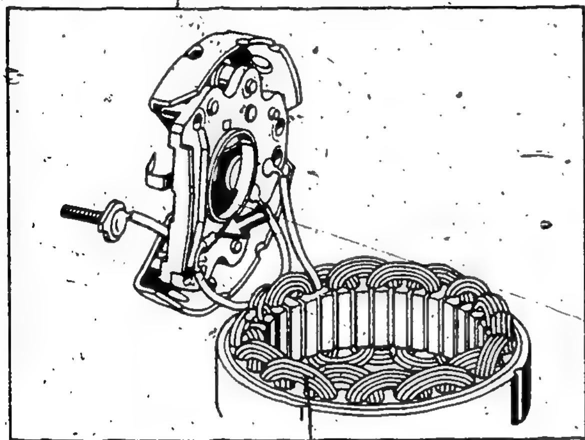
BOSCH
Geschäftsbereich KH, Kundendienst, Kfz-Ausrüstung.

Lift up the rectifier plate in order that the phase output from the stato winding (arrow Fig. 3) can be unsold from the connection plate.



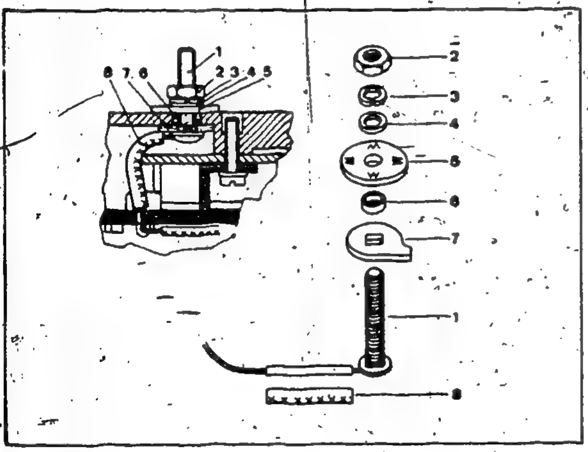
3

Push the electric lead from the parts set, with the insulating sleev pushed over it (protection against contact with the heat sink), from above into the opening in the connection plate which has been freed from solder. The lead is to be pushed in until the insulating sleev contacts the connection plate. Connect the unsoldered phase output wire to the electric lead and solder it into the connector plate (arrow Fig. 4).



4

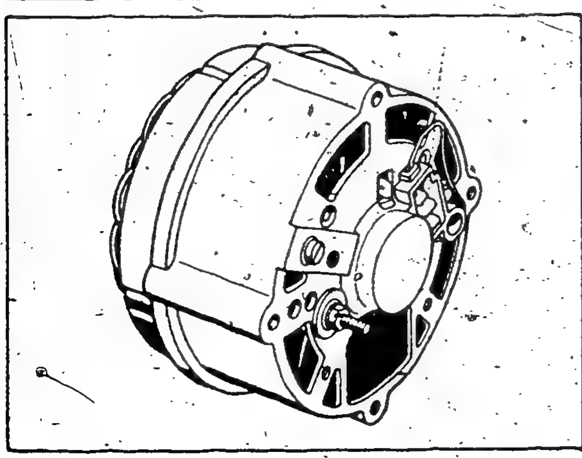
Secure terminal stud "W" in the hole drilled in the collector-ring end shield. Assemble the insulating parts in the correct order as shown in Fig. 5.



1 = Terminal stud "W" with electric lead
2 = Hexagon nut
3 = Spring washer
4 = Plain washer
5 = Insulating plate
6 = Insulating bushing
7 = Insulating washer
8 = Insulating sleeve

5

Re-assemble the alternator (Fig. 6)



6

0 120 300.. and 0 120 339.. G 1
Breakdown of Dustproof
Alternators with Diode Plates
1 127 320 141 or ..142 and 9 125 140 105

We have recently received reports that Type G 1 alternators in the dustproof design have broken down because the two eyelets leading to the heat sink have not provided a proper connection. As a result, the heat sink was not connected to ground through the collector-ring end-shield (see Fig. 1). A stronger type of riveting has therefore been introduced as from FD 431 (Nov. 1974).

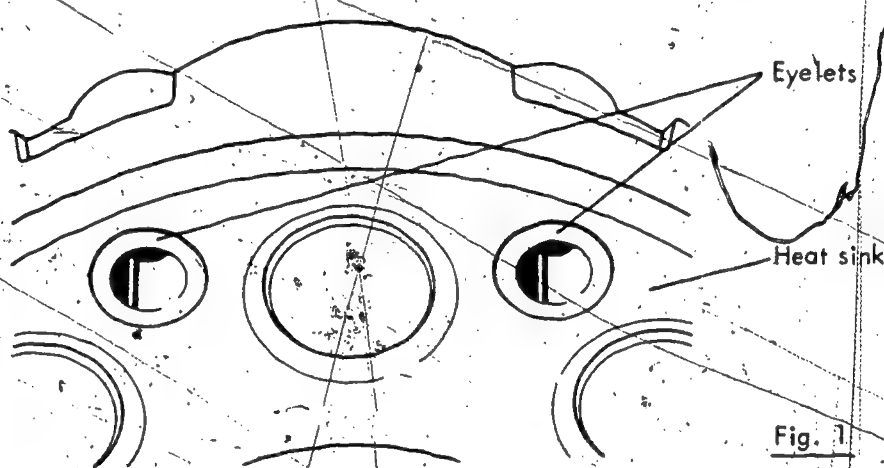


Fig. 1

Please note that this is a hidden defect which cannot always be recognized immediately!

If an alternator breaks down because of poor riveting at the negative diode plate, the following steps should be taken:

Drill off the heads of both eyelets.

Then, during assembly compensate for the difference in height resulting from the removal of the eyelet heads by placing 2 plain washers, 2 916 013 009 (0.5 mm thick between the negative diode plate and the support shoul eyes in the collector ring bearing. See Fig. 2.

L 25

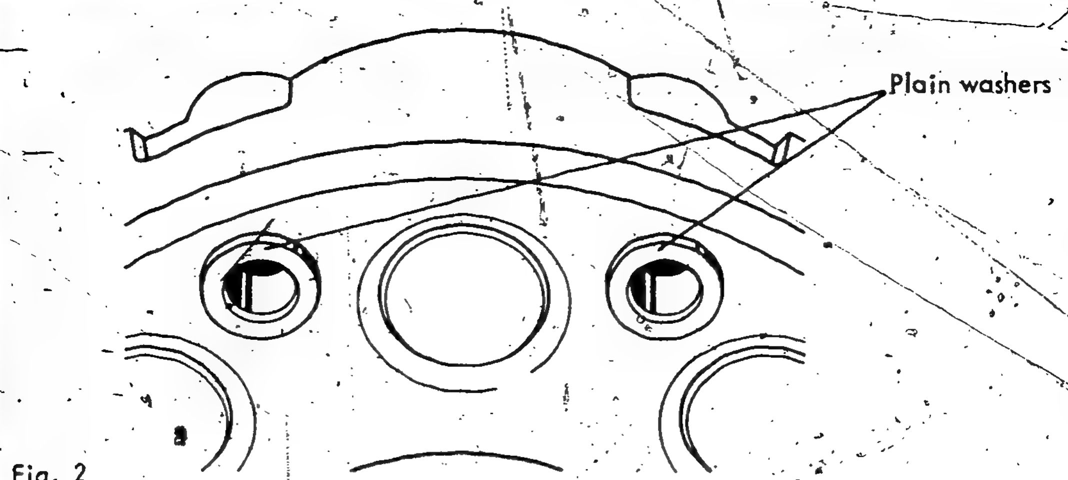


Fig. 2

Starting with FD 521 (Jan. 1975), the eyelets will no longer be riveted through the heat sink. Howev in order to ensure that the diode plate in the collector ring bearing is again at the correct height, the two support shoulder eyes in the collector ring bearing are raised when the new type of riveting is employed. See Fig. 3.

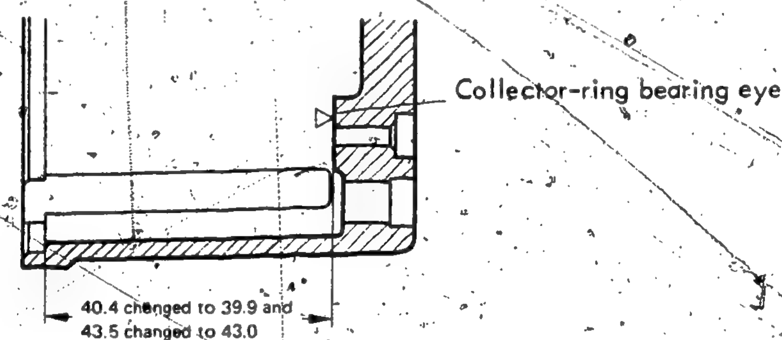


Fig. 3

When repairing Type G 1 dustproof alternators with new diode plates in the future, Fig. 3 must be observed. If the dimension is 40.4 or 43.5 mm, plain washers should be installed, but if the dimensio is 39.9. or 43.0 mm, this should not be done.

In order to ensure that after repairs have been made to Type G 1 dustproof alternators the collector-ring compartment is again properly sealed, felt washer 1 120 205 000 in the diode plate (see Fig. 4) must be replaced. Please order this washer from KH/ALP 2. The washer can be removed easily by pressing the locking device back from the brass rivet and then turning the cover ring.

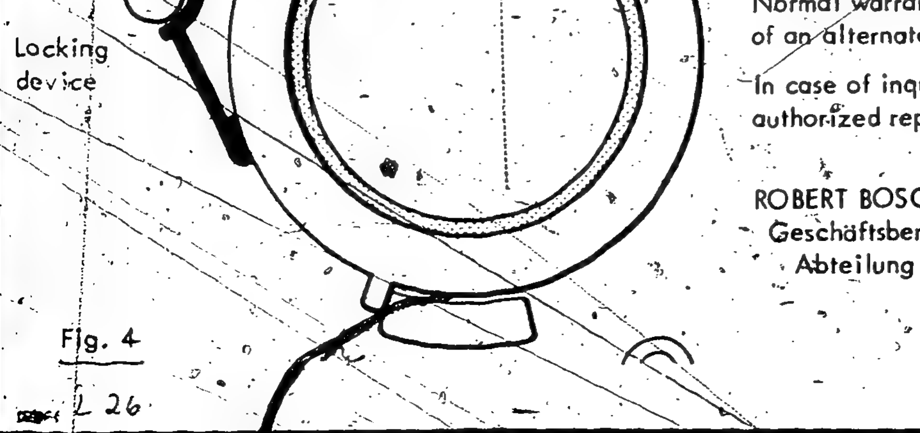


Fig. 4

Warranty Procedure

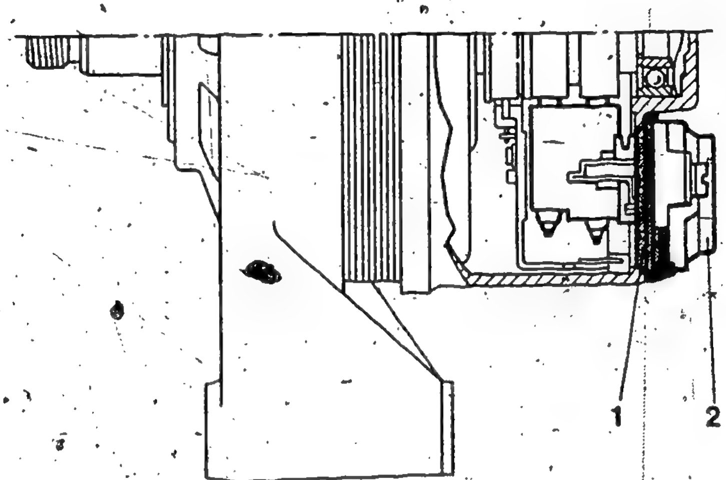
Normal warranty terms apply in the event of an alternator breakdown.

In case of inquiry, please contact your authorized representative.

ROBERT BOSCH GMBH
Geschäftsbereich K 1
Abteilung VAK 6

ALTERNATORS 0 120 339 ..

Replacing the attached-type transistor regulator



1 = New gasket

2 = Aftermarket hybrid regulator

On the dust-proof G1-14 V alternators 0 120 339 512, .. 513, .. 514, .. 521, .. 531, .. 535, ..536 and .. 539 the built-in transistor regulator (EE-14V) can be replaced if necessary by aftermarket hybrid regulator 1.197 311 090.

BOSCH Geschäftsbereich KH Kundendienst Kraftfahrzeug-Ausrüstung.

When installing the hybrid regulator, however, gasket 1 121 015 005 of the transistor regulator must be replaced by the new gasket

1 121 015 012

for hybrid regulators. This guarantees reliable protection against dust.
See picture for how to install.

Published by:

Robert Bosch GmbH
Division KH
Technical After-Sales Service (KH/VKD2)

Please direct questions and comments concerning the contents to our authorized representative in your country.

Testing and Repair

VDT-W-120/500 B
Ed. 1
Supersedes VDT-WPE 315/3 B

Alternators

G 1 – 14 V 13 A 19
G 1 – 14 V 18 A 22
G 1 – 14 V 20 A 21

Crankshaft-mounted, for motorcycles

Alternators

G 1 – 14 V 13 A 19	0 120 340 001
with regulator	0 190 600 009
	0 190 601 006
	0 192 062 001
and rectifier	0 197 002 002
G 1 – 14 V 18 A 22	0 120 340 003
with regulator	0 190 601 009 (only for 3.4 Ω field)
	0 192 062 002
and rectifier	0 197 002 003
G 1 – 14 V 20 A 21	0 120 340 002
with regulator	0 190 601 013 (only for 3.4 Ω field)
	0 192 062 002
and rectifier	0 197 002 003

1. Test equipment

Generator tester	EFAW 192	0 681 101 403
Ohmmeter (e. g. Pontavi)		Commercially available
Driving device	EFLM 4 A	0 681 221 002
Drive shaft	EFLB 1/3	1 683 050 002
Clamping flange (can be supplied by Bosch if required)	EFLJ 68/0/1	(user-fabricated)
Steel pin, 6 mm (0.2362") dia.		(user-fabricated)

BOSCH

Geschäftsbereich KH, Kundendienst Kfz-Ausrüstung
© by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50 Printed in the Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH (2.76)

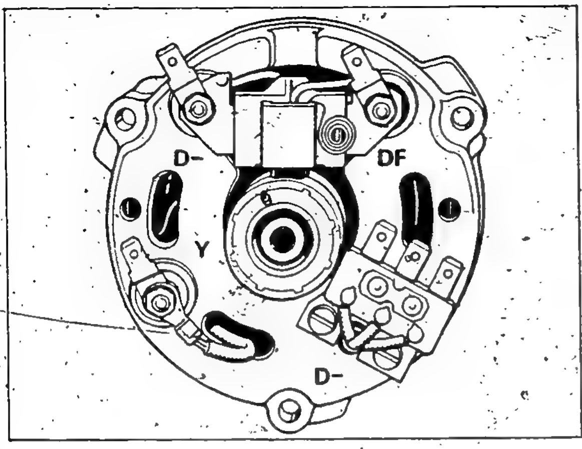
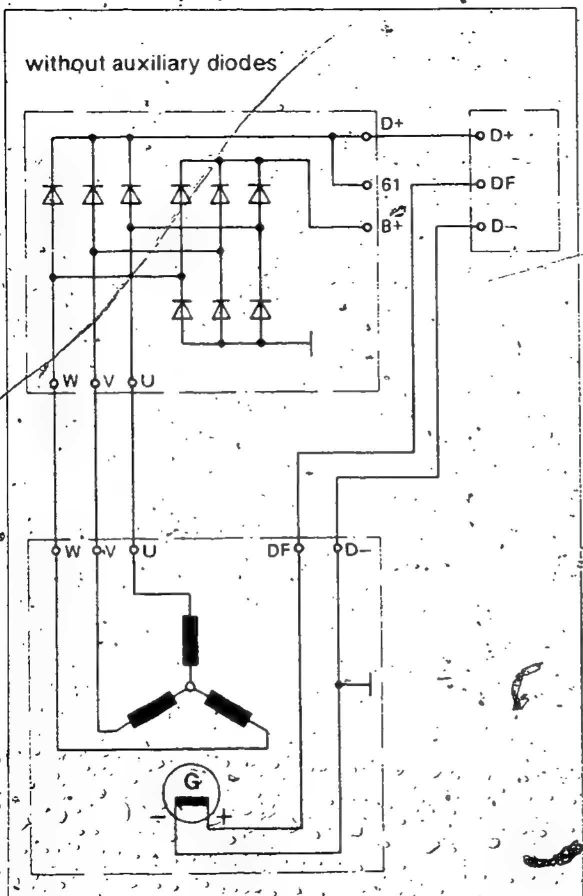


Fig. 1



2. Electric test of alternator in situ

Unscrew cover from face of engine housing. Test diodes with alternator tester EFAW 192. Operating instructions UBF 113/6 B must be used for this purpose. The diode plate is screwed in position behind the horn.

2.1 Checking the positive diodes (Figure 1):
Detach the two plug connections from the insulated positive diode plate (terminal B+730).

2.1.1. Mode of measurement selector switch in position
Connect one test cable to plug contact B+/30, the other cable consecutively to connections U, V, W and Y on alternator. When diodes are in order, the pointer must deflect to left or right into the green sector of the scale. The upper red-green scale applies for connections U, V and W, and the lower for connection Y.

2.1.2 Mode of measurement selector switch in position
Measuring points as under 2.1.1, but reverse the test cable connections after each check. When checking a good diode, the pointer will show full-scale deflection and with test connections reversed will show zero or max. 0.8 A.

2.2 Testing the negative diodes (Figure 1):
Detach plug connection D+/61 from diode plate.

2.2.1 Mode of measurement selector switch in position
One test cable to earth, the other consecutively to U, V, W and Y.
For results, see 2.1.1

2.2.2 Mode of measurement selector switch in position
Measuring points as under 2.2.1 but check each diode by testing in one direction and then reversing the test cable connections and testing in the other direction.
For results, see 2.1.2.

2.3 Testing the exciter diodes (Figure 1):

2.3.1 Mode of measurement selector switch in position
One test cable to snap-on connector D+ of the diode plate, the other consecutively to U, V and W. The pointer must now be in the green sector of the bottom scale.

2.3.2 Mode of measurement selector switch in position
Measuring points as under 2.3.1. but check each diode by testing in one direction and then reversing the test cable connections and testing in the other direction.
For results, see 2.1.2.

If a defective diode is found, the complete diode plate must be renewed. Exchanging this plate requires the removal of 4 screws.
Replacement of single diodes is impossible for design reasons.

2.4 Resistance test (Figure 2)

Detach all cables from alternator (D-, DF and U-V-W-Y plug connection).
Testing can be carried out with a commercially-available ohmmeter or with the generator tester.

2.4.1 Stator winding
Mode of measurement selector switch in position Ω
Measure resistance of stator winding between the phase outputs U-V, U-W and V-W (for 0 120 340 001).
The three measured values must be identical.
For 0 120 340 002 and . . 003, measure resistance of stator winding between the neutral point and the phase outputs, U-Y, V-Y and W-Y.
The three measured values must be identical.

2.4.2. Rotor winding:
Mode of measurement selector switch in position ∅
Carefully touch slip rings with probe points.

Resistance values

0 120 340 001	6.3 Ω	+10 %
0 120 340 002	3.4 Ω	+10 %
0 120 340 003	3.4 Ω	+10 %

3. Removal and refitting of alternator

Pull carbon brushes up using a suitable hook and lock in position. Release hex. socket screws and detach stator.

3.1 Withdraw rotor

Remove the hexagon-socket-head screw. Measure, from the contact surface of the screw head, the maximum depth of the hole. Taking the 6 mm (0.24 in) dia. steel rod cut it to this length less 12 mm (0.47 in). Introduce the rod into the hole and screw in the screw again until the rotor separates from the crankshaft.

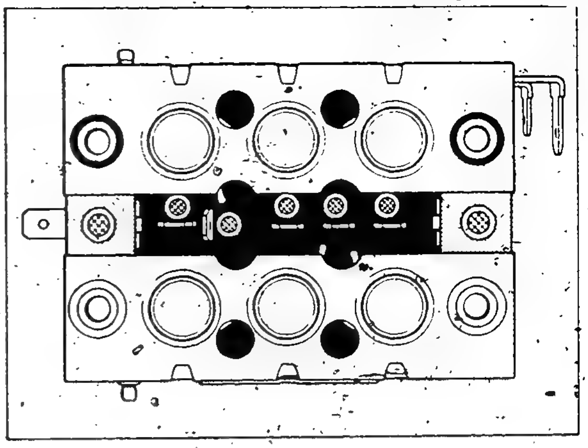
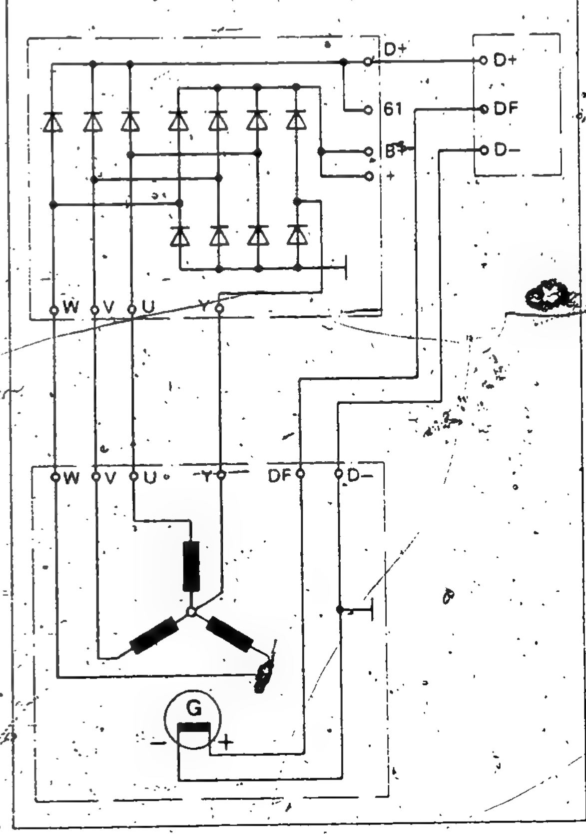


Fig. 2

with auxiliary diodes



Seite

4. Testing the alternator on an alternator test bench

Clamping fixtures required:

Driving device	EFLM 4 A	0 681 221 002
Drive shaft	EFLB 1/3	1 683 050 002
Clamping flange (can be supplied by Bosch if required)	EFLJ 68	(user-fabricated)

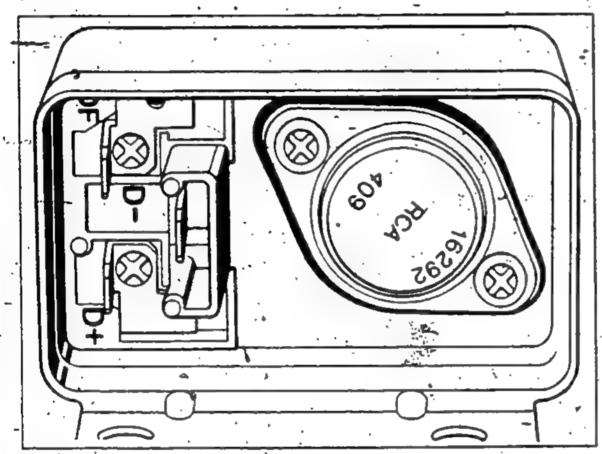


Fig. 3

4.1 Output test

For test conditions, see VDT-WPE 315/101 B.
Output data (with regulator):

Alternator	Load A	Max. speed min^{-1}
0 120 340 001	5	1350
	10	2300
	13	6000
0 120 340 002	4	1250
	13	2100
	20	6750
0 120 340 003	4	1250
	11	2000
	18	6750

4.2 Regulator test

4.2.1. Contact regulator 0 190 600 009
0 190 601 006
0 190 601 013

For test instructions see VDT-WPE 320/211 B.
Deviating from the test instructions, the regulator should be checked as follows:

Test speed **4500 min^{-1}**
Test load **13 A**
Regulator voltage **13.9 . . . 14.8 V**
For all other data, see VDT-WPE 320/211 B.

4.2.2. Electronic regulator 0 192 062 001
0 192 062 002

For test instructions, see VDT-WPE 320/213 B.
At 4000 rev/min and 5 A load the regulated voltage is:
0 192 062 001 13.9 ... 14.9 V
0 192 062 002 13.7 ... 14.5 V

5. Technical data

	0 120 340 001	0 120 340 002, .. 003
Resistance		
of rotor excitation winding	6.3 Ω + 10 %	3.4 Ω + 10 %
of three-phase stator winding between phase outputs	0.5 Ω + 10 %	0.38 Ω + 10 %
min. dia. of collector rings	26.8 mm	26.8 mm

INTRODUCTION OF SEALED BALL BEARINGS ON ALTERNATORS

VDT-I-120/102 En
3.1982
supersedes 9.75 edition

0 120 400 .. - .. 489 .. (K1)
0 120 469 .. (N1)

Ball bearings 1 900 900 391 have so far been installed and sealed with 2 "NILOS gaskets" in various versions of type series K1 and N1 with uprated drive-end bearing. The production of these alternators was recently changed over to sealed ball bearings 1 120 900 008 and .. 010.

The NILOS gaskets previously contained in parts sets 1 127 011 019 and .. 032 must no longer be installed when installing the sealed ball bearing.

After the relevant service-part microfiches EE.. have been changed over and after the previously installed ball bearings 1 900 900 391 have been used up, the parts sets for rotors will be supplied without NILOS gaskets.

In case of inquiries, please contact your local represantative.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

M5

M 5

DAMAGE TO THE DRIVE-END-BEARING HOUSING BY PRESSING OUT THE ROTOR ON VW AND AUDI ALTERNATORS

Alternators 0 120 4..

Due to the conversion of certain K-alternators for VW and Audi to drive-end bearings press-fitted to the shaft, the drive end shield or support plate which is screwed from the inside on these alternators, can be damaged when the rotor is pressed out.

When pressing out the rotor a three-arm puller, part no. 57-036 from the firm of Schrem in 7928 Giengen 1, Postfach 1504, should be used.

Apply the puller to the drive-end bearing in such a manner that the arms grip behind the support plate. Only in this way can one guarantee that the fastening screws will not be broken off when the rotor is pressed out.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung
© by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

IMPROVEMENT TO THE V-BELT SERVICE LIFE

VDT-I-120/118 En

12.1981

and remedies for droning noises with
K1 alternators

In certain speed ranges droning noises can occur with the VW vehicles Polo, Derby, Golf (Rabbit), Jetta and Passat with 0.9 ... 1.3-l engines. To remedy this, VW are now fitting these vehicles with pulleys with diameter 71 mm instead of 61 mm. The V-belt dimensions are now 9.5 x 695.
By increasing the size of the pulleys the service life of the V-belts is also increased.

Ford and Saab have also been able to increase the service life of their V-belts by increasing the pulley diameter to 71 mm.
Dismantling and fitting the pulleys is done as previously with a band wrench.
The tightening torque for the fastening nut remains 35 ... 45 Nm.

BOSCH Geschäftsbereich KH, Kundendienst Kfz-Ausrüstung.

PLASTIC RING IN COLLECTOR-RING END
SHIELD OF GENERATORS
0 120 400 .. AND 0 120 489 ..

To achieve increased vibration strength in K 1 generators, a plastic ring is used on certain versions in the collector-ring end bearing seat. First used in generator 0 120 489 192. This plastic ring prevents wear of the bearing seat.

In case of repair if damaged, this plastic ring can be replaced. Service part number 1 120 591 038.

Slide the plastic ring into the bearing seat so that the lateral lug lies in the groove of the bearing seat. By thinly coating the ball-bearing seat in the plastic ring with grease Ft1v34 this guarantees easy introduction of the rotor with ball bearing by hand.

Retrofitting of the plastic bushing in normal generators is not possible due to the different bearing dimensions.

Published by:

Robert Bosch GmbH
Division KH
After-Sales Service Department for
Training and Technology (KH/VSK)

Please direct questions and comments concerning the contents to our authorized representative in your country.

Technical Bulletin

BOSCH
Geschäftsbereich KH, Kundendienst Kraftfahrzeug-Ausrüstung.

00...12
VDT-I-120/123 En
5.1985
supersedes Ed. 9.1984

NEW RECTIFIERS FOR K1 ALTERNATORS
0 120 400 .., ..489..
IN COMMERCIAL VEHICLES

At the end of 1984, K1-commercial vehicle alternators with screw connections were converted to new rectifier systems.

Features of this new, improved rectifier system are:

- Power diodes of type ED 7
- Stronger exciter diodes
- No soldered connection for pins D+ and W on the injection-moulded circuit board. This means no break-down even with increased vibrational loading.
- Hook loops at soldered points U, V, W. This means that the soldered locations for stator connections are strain-relieved.
- Plastic insulators at terminals D+ and W.

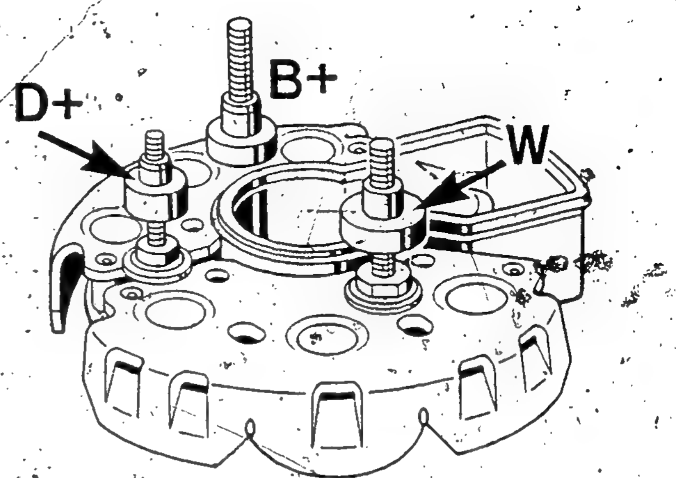
In case of replacement, new rectifiers can also be installed in older generators with screw connections. Under Item 806 a parts kit has been established that contains both the rectifier assembly and the two insulators for connections D+ and W.

Technical Bulletin

BOSCH
Geschäftsbereich KH. Kundendienst Kraftfahrzeug-Ausrüstung
© by Robert Bosch GmbH, Postfach 50, D-7000 Stuttgart 1. Printed in the Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.

M9

M9



Screw terminal W is installed in the rectifier of the parts kit. If the alternator which is to be repaired does not have terminal W, it is possible to remove the screw terminal in the rectifier. To do this, loosen the round nut, and first press back the terminal stud just enough so that the connecting wire to the power diode can be cut off. Press the remaining wire end back into the slot in the base plate.

Please direct questions and comments concerning the contents to our authorized representative in your country.

After-sales Service

Technical Bulletin

New Product

12

VDT-I-120/1 B
Edition 8.1975

N 1 Alternators
(Housing dia. 130 ... 139 mm)

At present there are the following models of type N

0 120 469 5..
with integral regulator

N 1 – 14 V 75 A 20

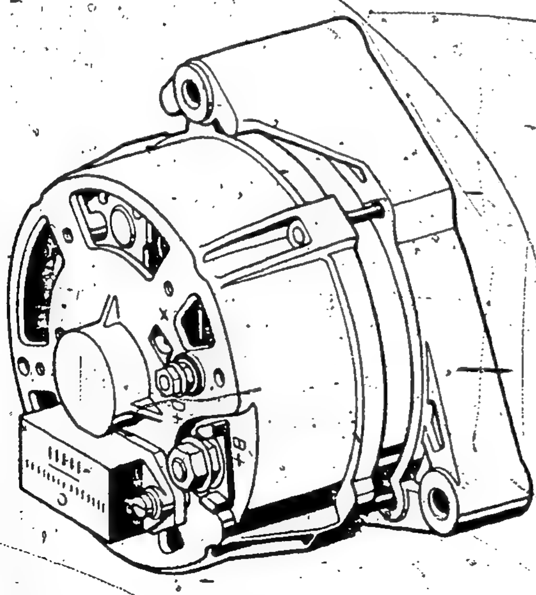
0 120 450 0..
with separate regulator

N 1 – 14 V 70 A 20
N 1 – 14 V 65 A 18
N 1 – 14 V 90 A 22

0 120 450 ../ 0 120 469 ..
integral and separate regulator

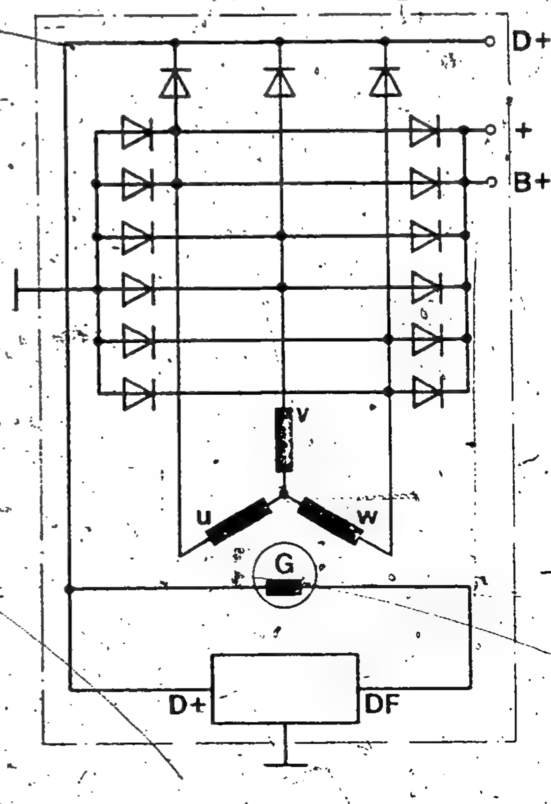
N 1 – 28 V 55 A 25

Fig. 1



N 1 – 14 V 75 A 20

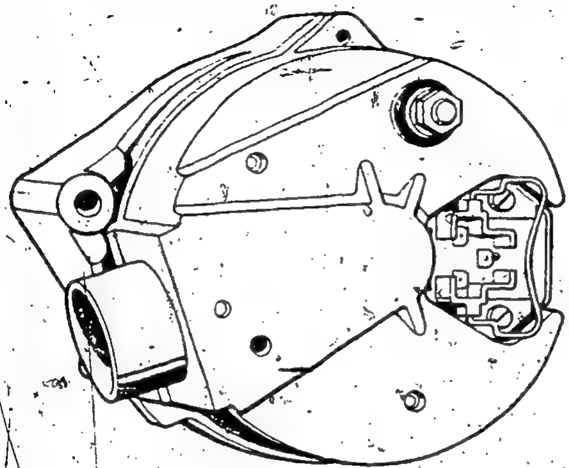
Diagram 1



BOSCH
Geschäftsbereich KH Kundendienst
© by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50. Printed in the Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

M11

Fig. 2



N 1 – 14 V 70 A 20

Diagram 2

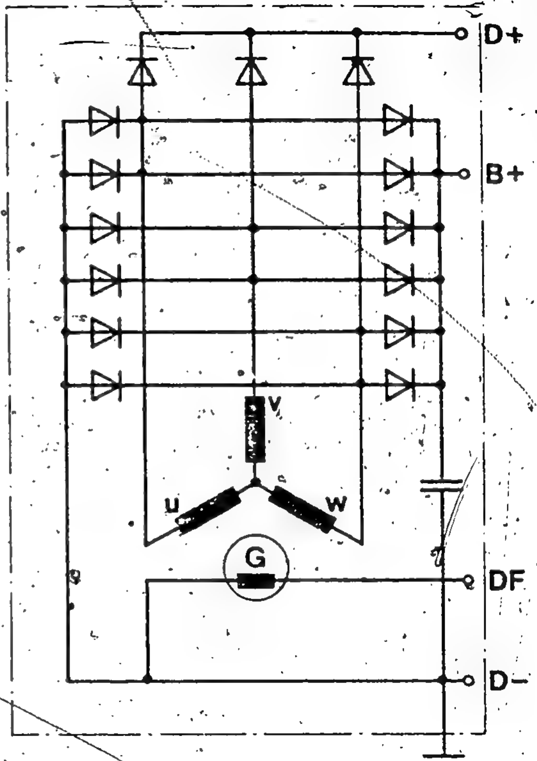
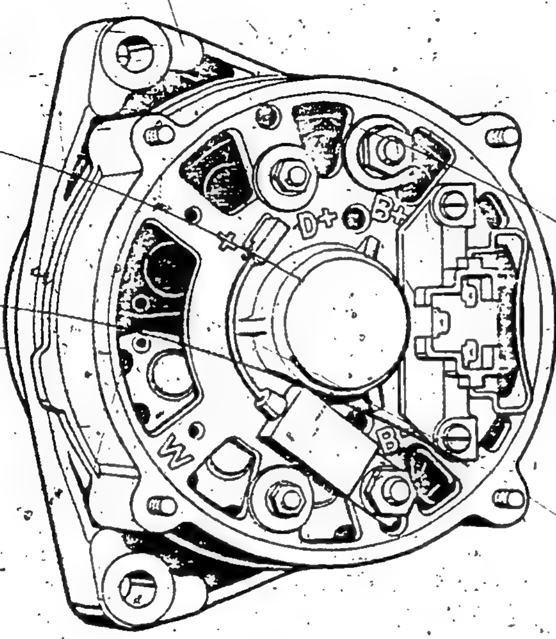
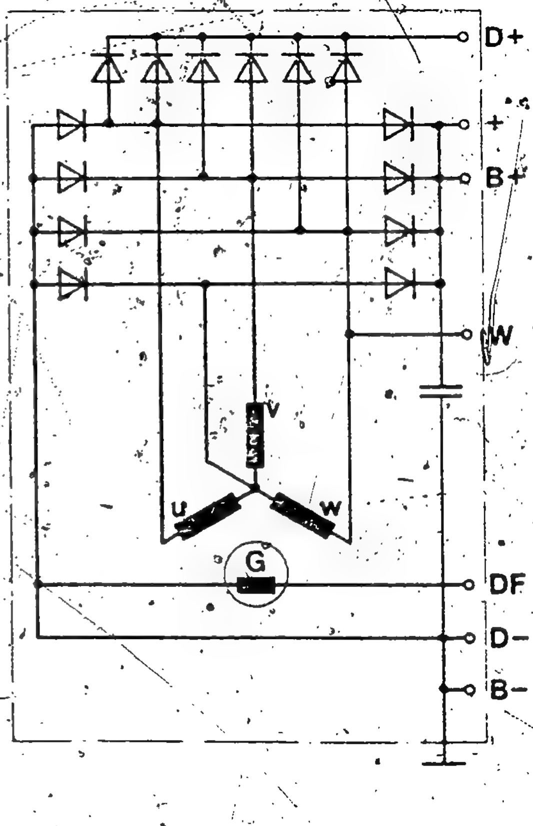


Fig. 3



N 1 – 28 V 55 A 25

Diagram 3



The basic N 1 model 0 120 469 5 .. differs essentially from the K 1 generator, in the following points:

- Shorter through bolts, thus rendering a separately attached grounding screw necessary.
- An additional B + insulating part.
- A D + terminal stud.
- Each power diode has a second power diode connected across it in parallel.
- Integral transistor regulator.
- Field winding resistance of 3.4 Ω.
- Cast aluminum fan.

The N 1 generators 0 120 450 001/2 differ from the basic N 1 model, in the following points:

- The generator was developed specially for VW.
- It is operated only with an original VW fan and pulley combination.
- Collector-ring end-shield with air-intake vent (cast-on).
- Three M 6 through bolts instead of the usual four M 5 through bolts.
- Generator is dust- and water-proof.
- Separate vibrating-type regulator and a 4 Ω field winding; D + terminal stud is missing.
- Suppression capacitor fitted and screwed directly onto the B + terminal stud.
- Two auxiliary diodes (*) connected to the neutral point on model N 1 – 90 A.

The 28 V type N 1 generators have the following constructional characteristics:

- Dust-proof.
- Dia. of collector ring and collector ring bearing = 32 mm (normal N 1 28 mm).
- Long through bolts with ground terminal.
- B+ / B– / D+ / W are screw connections.
- Terminal "W" = a.c. voltage output of rotational speed data for control purposes.
- The second diode across each power diode (as in the basic N 1 model) is not fitted. In this case just 2 auxiliary diodes (*) are present.
- 6 exciter diodes (**).

(*) Auxiliary diodes (see diagram 3)

As a result of the 3rd harmonic of generator phase voltage (caused e.g. by the geometry of the claw-poles), the neutral point can assume a potential which periodically lies above/below the potential of B+ / B–. By means of the auxiliary diodes this effect is used to increase power and efficiency in the upper rotational-speed range.

(**) 6 Exciter Diodes

In order to be able to allow the high short-circuit voltage to flow without overloading the exciter diodes when the overvoltage protection device operates, the exciter diodes are parallel-connected in pairs.

In case of inquiry, please contact your authorized representative.

ROBERT BOSCH GMBH
Geschäftsbereich KH
Kundendienstschule

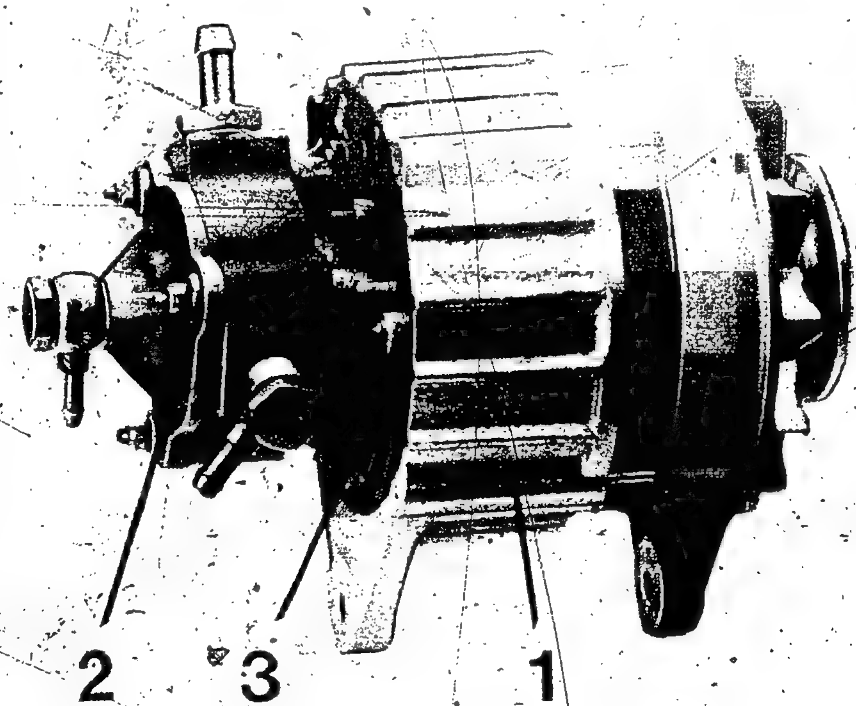
New Product 00...12

ALTERNATOR WITH BUILT-ON VACUUM PUMP AND ATTACHED-TYPE TRANSISTOR REGULATOR

VDT-I-120/4 En
1.1984

In diesel-engined passenger cars and vans the vacuum servo-assisted brake system normally requires a vacuum pump. Currently these pumps are predominantly flanged directly onto the engine or are driven by the camshaft by means of V-belt.

An alternative is an alternator with built-on vacuum pump (0 120 488 .. with attached-type transistor regulator 1 197 311 ..).



1 = Alternator   2 = Vacuum pump   3 = Attached-type transistor regulator

BOSCH
Geschäftsbereich KH, Kundendienst, Kfz-Ausrüstung.
© by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50. Printed in the Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.

M14

M 14

The capacity of the vacuum pump meets the requirements of modern diesel passenger cars and vans of the medium and upper power classes.

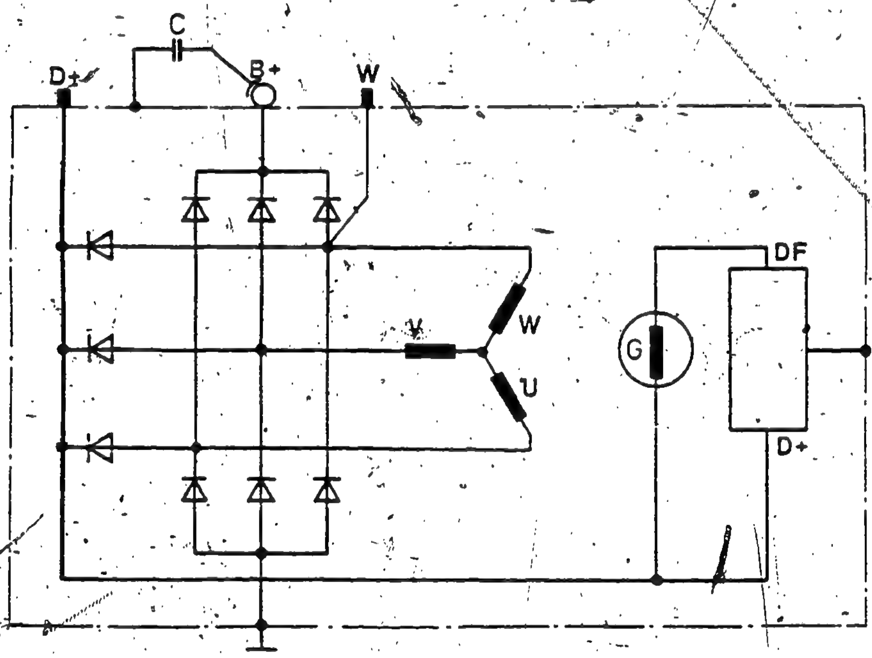
Advantages:

- No special drive required.
- No space required on end of engine
- No separate mounting required.
- Simple retensioning of belt
- Operation monitored by means of charged indicator lamp
- High vacuum for small size

Design:

12-pole, internally ventilated synchronous generator with built-in rectifier in 3-phase bridge circuit with silicon diodes.

Circuit diagram



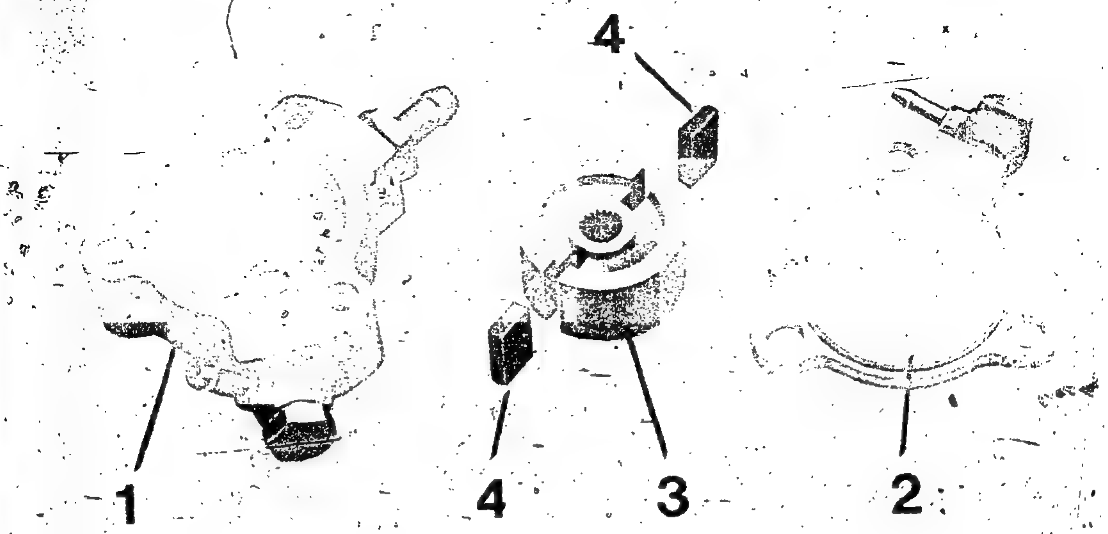
Terminals B+, B- and W are in the form of stud terminals.
The EL regulator is attached to the alternator.

M15

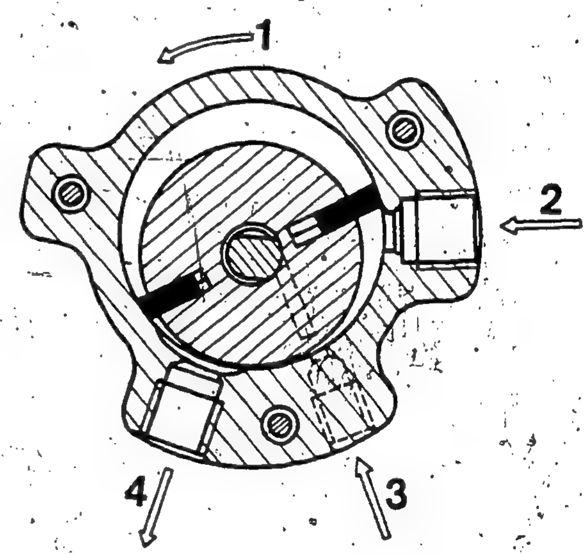
M 15

Vacuum pump

Construction of rotary-spool vacuum pump with engine-oil suction lubrication.



1 = Pump housing
2 = Pump housing cover with O-ring
3 = Rotor
4 = Sliders



Principle of vacuum pump

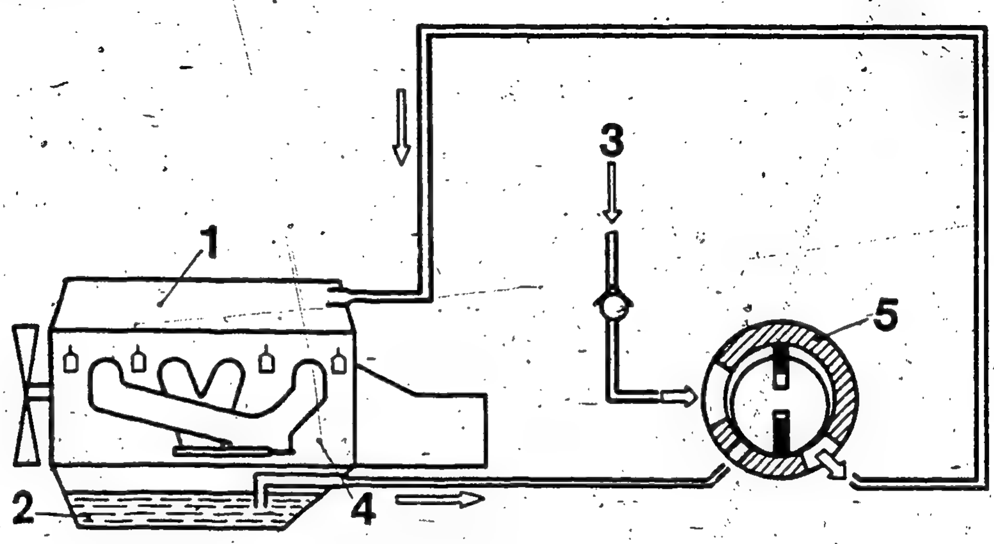
1 = Direction or rotation
2 = Air
3 = Oil
4 = Oil-air

Technical data

Type:	2-vane rotary-spool
Theoretical delivery:	27 cm^3 per revolution
Evacuation time: 5 l tank at 1700 min^{-1}	to 0.5 bar in 95 sec.
Max. vacuum:	0.95 bar
Lubrication:	Suction oil from engine
Power consumption: (at max. vacuum):	at 6000 min^{-1} 250 W at 10000 min^{-1} 600 W
Maximum speed:	15 000 min^{-1}

M 16

Notes on operation:



1 = Valve cover
2 = Oil sump
3 = Brake servo-assist unit
4 = Engine
5 = Vacuum pump

The rotary-spool vacuum pump is lubricated and sealed by engine oil which is drawn-in by the pump itself from the engine oil sump.

Warranty information:

All alternators with vacuum pump on which a fault relating to materials or workmanship is claimed on the vacuum pump within the warranty period should be sent in their original condition together with the usual warranty documents G 20 or G 21, stating the reason for the complaint, to:

Inside Germany:

Robert Bosch GmbH
Abteilung K9/VAK2
Robert Bosch Str.

7141 Schwieberdingen

Outside Germany:
Through RG/AV to:
Robert Bosch GmbH
Abteilung KH/LAV
Auf der Breite 4

D 7500 Karlsruhe 41

This procedure applies only until December 1985

Published by:

Robert Bosch GmbH
Division KH
After-Sales Service Department For
Training and Technology (KH/VSK)

Please direct questions and comments concerning the contents to our authorized representative in your country.

Improved collector-ring end-shield seat on a number of different alternators

In order to improve the resistance to vibration of the alternator types listed below, a collector-ring end-shield with an O-ring in the ball-bearing seat is fitted as well as a ball bearing which is sealed from both sides.

Due to the ever-increasing power required from modern-day engines, the products and components fitted to them are also subject to higher demands. To prevent wear to the ball-bearing seat on the collector-ring end of the alternator due to increased vibratory acceleration, the ball-bearing seat has been modified. An O-ring fitted in a groove in the collector-ring end shield prevents this wear.

As a result of this modification, item 22 (spring washer 1 120 150 000) is no longer required, nor is it necessary to grease the ball bearing.
Retrofitting the O-ring in collector-ring end shields not provided with a groove is not possible.

Alternator	Old Collector-ring end shield Ball bearing	New Collector-ring end shield O-ring Ball bearing
0 120 489 500	1 125 884 288	1 125 884 356
501	1 900 905 202	1 120 210 001
519		1 900 905 277
520		
521		
532		
535		
557		
558		
559		
560		
569		
581		
582		
598		
599		
600		
622		
676		
678		

BOSCH Geschäftsbereich KH. Kundendienst. Kfz-Ausrüstung.

M18

828 M 18

Alternator	Old Collector-ring end shield Ball bearing	New Collector-ring end shield O-ring Ball bearing
0 120 489 679	1 125 884 288	1 125 884 356
698	1 900 905 202	1 120 210 001
699		1 900 905 277
744		
745		
746		
747		
755		
0 120 489 711	1 125 884 342	1 125 884 357
712	1 900 905 202	1 120 210 001
713		1 900 905 277
714		
732		
758		
785		
0 120 489 613	1 125 884 244	1 125 884 361
614	1 900 905 202	1 120 210 001
615		1 900 905 227
660		
736		
737		
0 120 489 651	1 125 884 244	1 125 884 362
652	1 900 905 202	1 120 210 001
653		1 900 905 277
654		
655		
656		
657		
659		
735		

Further models are to follow, service parts can be taken from the Service-Parts Microfiches.

PLASTIC RING IN COLLECTOR-RING END SHIELD OF GENERATORS 0 120 400 .. AND 0 120 489 ..

VDT-I-120/122 En
4.1984

To achieve increased vibration strength in K 1 generators, a plastic ring is used on certain versions in the collector-ring end bearing seat. First used in generator 0 120 489 192. This plastic ring prevents wear of the bearing seat.

In case of repair if damaged, this plastic ring can be replaced. Service part number 1 120 591 038.

Slide the plastic ring into the bearing seat so that the lateral lug lies in the groove of the bearing seat. By thinly coating the ball-bearing seat in the plastic ring with grease Ft1v34 this guarantees easy introduction of the rotor with ball bearing by hand.

Retrofitting of the plastic bushing in normal generators is not possible due to the different bearing dimensions.

Published by:

Robert Bosch GmbH
Division KH
After-Sales Service Department for
Training and Technology (KH/VSK)

Please direct questions and comments concerning the contents to our authorized representative in your country.

Technical Bulletin

NEW RECTIFIERS FOR K1 ALTERNATORS
0 120 400 .., ..489..
IN COMMERCIAL VEHICLES

At the end of 1984, K1-commercial vehicle alternators with screw connections were converted to new rectifier systems.

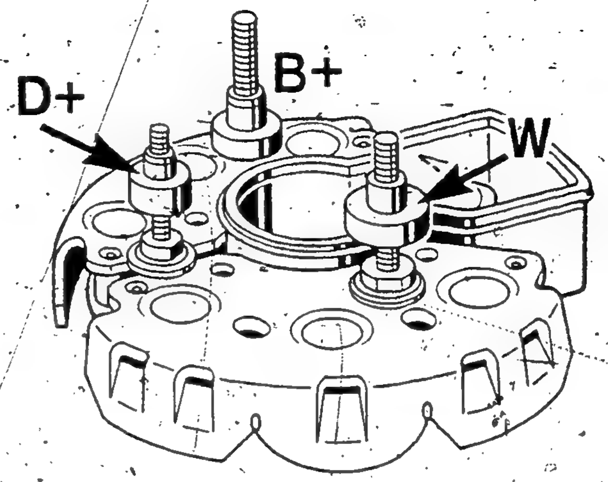
Features of this new, improved rectifier system are:

- Power diodes of type ED 7
- Stronger exciter diodes
- No soldered connection for pins D+ and W on the injection-moulded circuit board. This means no break-down even with increased vibrational loading.
- Hook loops at soldered points U, V, W. This means that the soldered locations for stator connections are strain-relieved.
- Plastic insulators at terminals D+ and W.

In case of replacement, new rectifiers can also be installed in older generators with screw connections. Under Item 806 a parts kit has been established that contains both the rectifier assembly and the two insulators for connections D+ and W.

Technical Bulletin

BOSCH
Geschäftsbereich KH. Kundendienst Kraftfahrzeug-Ausrüstung.



Screw terminal W is installed in the rectifier of the parts kit. If the alternator which is to be repaired does not have terminal W, it is possible to remove the screw terminal in the rectifier. To do this, loosen the round nut, and first press back the terminal stud just enough so that the connecting wire to the power diode can be cut off. Press the remaining wire end back into the slot in the base plate.

Please direct questions and comments concerning the contents to our authorized representative in your country.

Technical Bulletin

VDT-BME 315/33 B
< VDT-I-120/100 B >
Edition 1.1975
Translation of German edition of 3.12.1974

LJ 12

0 120 489 500/532 – K1 (R) 14 V 35 A 20
0 120 489 520/535 – 14 V 55 A 20

Breakdown of diodes
Audi 80 and VW-Passat

Alternators in Audi 80 and VW-Passat have in several cases broken down recently because of damaged power diodes. Voltage peaks in the vehicle electric system have been diagnosed as the cause of this:

As from now, during alternator repair, the following parts have to be fitted (if they are not already present) against payment:

Suppression capacitor	0 290 800 036
with fastening screw	2 910 021 152
and spring lock washer	2 916 063 006

Warranty procedure

In a case of alternator breakdown within the alternator warranty period, the suppression capacitor may be fitted free of charge.

In case of inquiry, please contact your authorized representative.

ROBERT BOSCH GMBH
Geschäftsbereich K 1
Abteilung VAK 6

BOSCH

M23

ALTERNATOR
for BMW boat engines with ignition safeguard
Part No. 0 120 489 890, ..981

VDT-I-120/111 En
2.1980

General

The US Coast Guard Regulations for gasoline-driven boat engines demand a so-called "ignition safeguard" in the products for the electrical engine equipment (including the alternator). This is to make sure that explosions do not occur when operated in a combustible atmosphere.

"Ignition safeguard" characteristics

The following special precautions have been introduced in alternators with "ignition safeguard":-

a special shaped cover disc on the rotor;

modified shoulder on the rotor side of the rectifier.

both these measures result in a lengthened air gap in the labyrinths between the rectifier and the rotor;

additional seal between the regulator 0 192 052 021 and the brush holders.

Workshop instructions

When doing repair work on alternators, e.g. when replacing the rectifier, you should make sure that the centre bore in the rectifier housing is concentric with the bearing seat in the collector-ring end shield.

After soldering the new soldered and welded points should be insulated with lacquer coating no. 190 from the firm of Dr. Beck, Postbox 180-280, D-2000 Hamburg or with insulating lacquer of the insulating classes A, E and B as per IEC 85/VDE 0 530 and per temperature index 130...140 according to IEC 216. The drying out time for the lacquer is approx. 24 hours at room temperature.

BOSCH
Geschäftsbereich KH, Kundendienst, Kfz-Ausrüstung.
© by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50. Printed in the Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.

M 24

After-sales Service Instructions

Repair

12

VDT-W-120/100 B
Ed. 2
supersedes Ed. 1 dated 8.67
and Suppl. 1 dated 8.68

Alternators

T 1 0 120 600 5 . .

T 2 0 121 600 5 . .

with Press-in Diodes

BOSCH Kundendienst Kraftfahrzeug-Ausrüstung

M25

Table of Contents

Automotive Equipment Division After-Sales Service
Department for Technical Publication KH/VDT
D-7 Stuttgart 1, Postfach 50

Questions and comments on the contents are to be directed to our authorized representative in your country.

Printed in the Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne
par Robert Bosch GmbH.
(7.75)

M 26

M26

A2

1. Test Equipment, Tools, Lubricating and Sealing Materials, and Technical Documentation

Test Equipment

Test panel	EFAW 81	0 681 169 013
Transformer panel	EFAW 82	0 681 169 014
Insulation tester up to 600 V AC test voltage		commercial type
Interturn short-circuit tester	EFAW 90	0 681 169 034
or	EFAW 95	0 681 169 020
Dial indicator	EFAW 7	1 687 233 011
Magnetic instrument stand	T-M 1 (EW/MS 1 B 1	4 581 601 124 0 601 980 001)
Alternator tester	EFAW 192	0 681 101 403
Ohmmeter	e.g. Pontavi	commercial type

Tools

Clamping device	KDAW 9999 (EFAW 9	0 681 269 007)
Tailstock chuck for lathe with		
Morse taper 1	GDF 85 R 3	2 608 574 001
Morse taper 2	KDAW 9987 (EFAW 75 A	0 681 269 013)
Morse taper 3	KDAW 9990 (EFAW 75 B	0 681 269 014)
Press-in tools for radial seals	manufacture locally according to Figs. 36 and 37 (Fig. 37 EFLJ64 1 683 203 011)	
Press-out tool for radial seal	manufacture locally according to Fig. 35	
Press-in mandrel for diodes	KDLJ 6499/0/1 (EFLJ 57 A/0/1	1 687 931 000)
Puller for ball bearings		commercial type
Puller for roller bearings	manufacture locally according to Fig. 34	
Holding mechanism for fan belt pulley		commercial type
Arbor press		commercial type

Lubricating and Sealing Materials

Anti-friction bearing grease Ft 1 v 34	50 g tube 250 g tube	5 700 009 005 5 700 009 025
Molykote paste Ft 70 v 1	250 g tin	5 700 040 125
Silicone oil Ol 63 v 2	0.1 l can	5 701 112 513
Sealing putty Kk 1 v 3	0.5 kg can	5 703 452 150
Moisture protection lacquer No. 120 or No. 130		produced by Dr. Beck, Co. Hamburg Postfach 280 - 180
or electro-Insulating Spray clear No. 1532		produced by 3 M Corp.
Epoxy resin putty VS 11 715 Bg	100 g tin	5 941 070 110
Hardener VS 11 716 Bg	100 g tin	5 941 080 110

Technical Documentation

Service Parts Lists	VDT-EVE 315/4 B,../5B,../7B
Test Instructions for Alternators	VDT-WPE 315/101 B
Test Specifications for Alternators	VDT-WPE 315/201 B
Test Instructions for Transistor Regulators	VDT-WPE 320/104 B
Test Specifications for Transistor Regulators	VDT-WPE 320/212B,../213B
Instructions for Using Alternator Tester	VDT-WWF 113/6 B

2. Dismantling the Alternator

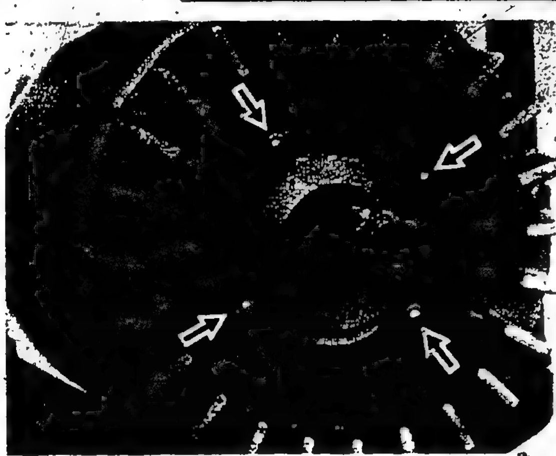
1

Clamp the alternator in the mounting device.
Hold the pulley with a suitable holding device and release the nut with an open-end wrench (SW 36).
Remove the pulley and the fan. Mark the positions of the drive end shield and the collector-ring end shield.
When dismantling alternators with shaft stub at each end, release the coupling before removing the pulley.
When dismantling alternators with internal cooling detach the cover plate from the brush holder. Unscrew connections at the brush holder (use box wrench SW 10) and release the two fillister head screws at the brush holder (Fig. 1).

2

Unscrew the 4 inner and 8 outer fastening screws!

Remove the drive end shield.

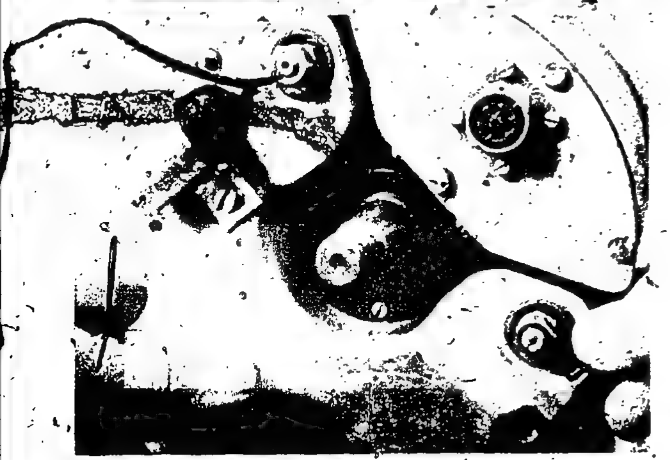


3

Alternators with external cooling:

Unscrew the 4 nuts (arrows). Unscrew the fastening screws at the drive end shield.

Remove the drive end shield.



4

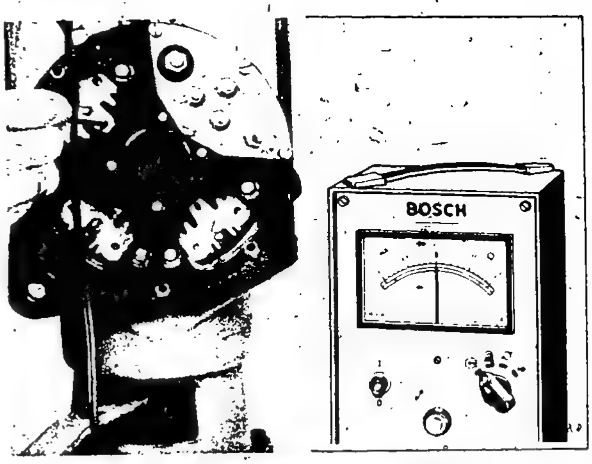
Remove the suction cover and the cover plate (if present); remove the remaining fastening screws around the outside. Do not release the fastening screws holding the stator winding.

In alternators fitted with screw-type diodes, the built-in **and connected** diodes must be checked with Tester EFAW 192 before the alternator is dismantled further.

In order to do this, the measurement mode selector switch must be in the position marked ⊰⊕⊱.

It is not possible to test the **screw-type** diodes individually using the alternator tester with the alternator dismantled.

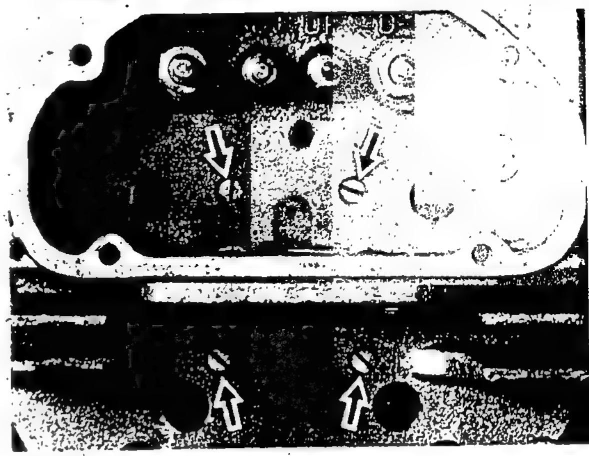
Unscrew the 4 fillister head screws in the brush holder. Release the phase connections. Take off the collector-ring end shield.
Pull the rotor out of the stator frame.



5

Alternators with external cooling:

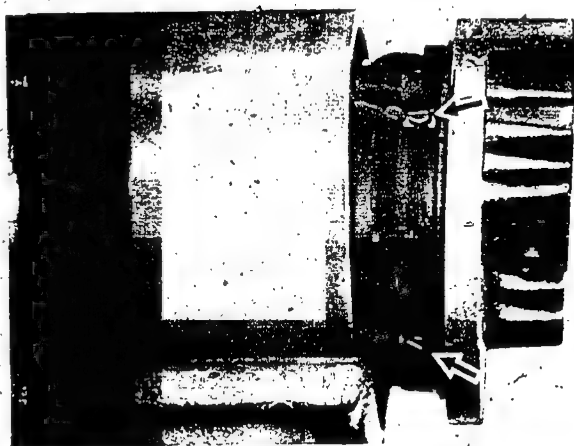
Open the terminal box and remove the capacitor. Loosen the 4 screws (arrows) at the collector-ring housing somewhat and remove the remaining fastening screws at the collector-ring end shield.



6

Alternators with external cooling:

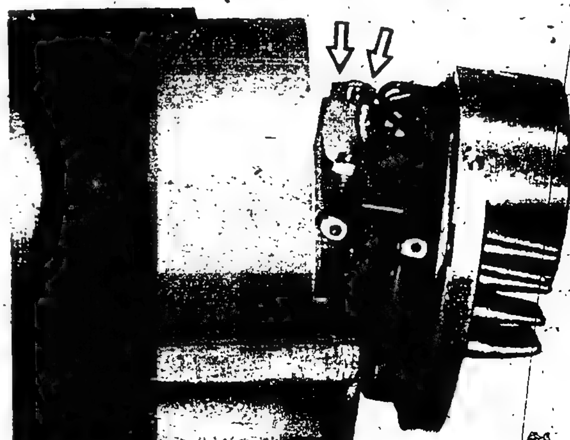
Press the rotor together with the collector-ring end shield far enough out of the stator frame so that the phase connections (arrows) become visible. Undo the phase connections.



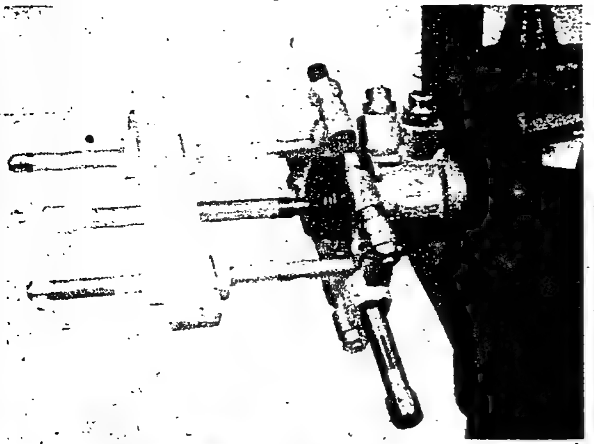
7

Alternators with external cooling:

Undo the connections at the brush holder (arrows). Remove the brush holder and unscrew the 4 fastening screws at the collector ring housing completely (see Fig. 6).
Take off the housing, pull out the rotor.



8

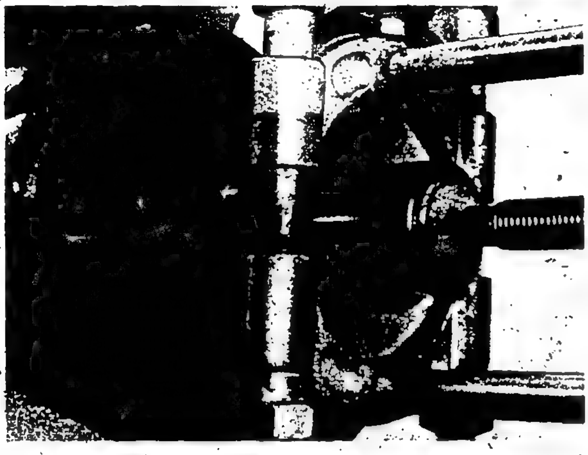


9

Clamp the rotor in the mounting device.
In the case of generators fitted with ball bearings, replace the ball bearing after about 160,000 – 300,000 km of operation depending on operating conditions.

Caution:
Remove the ball bearing only when it is to be replaced because it will be damaged when pulled off the shaft.

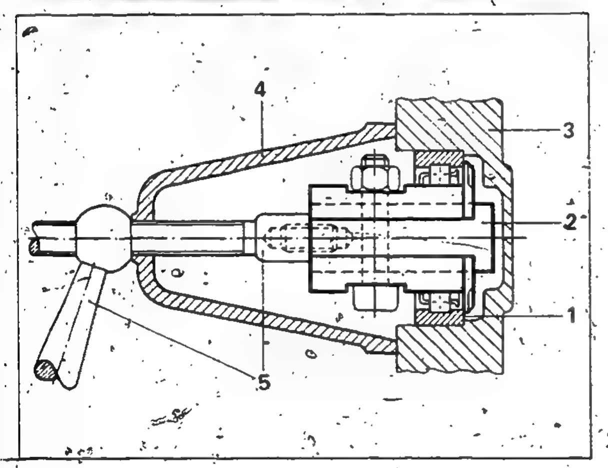
Pull off the ball bearing at the collector-ring end. Remove the brush holder housing.



10

Alternators with cylindrical roller bearing

Pull the cylindrical roller bearing inner ring and intermediate ring off the rotor shaft.



11

Pull the cylindrical roller bearing from the collector-ring end shield using a puller (manufacture locally according to Fig. 34) and a puller bell.

1 = Roller bearing
2 = Puller
3 = Collector-ring end shield
4 = Puller bell from KDAW 9995
5 = Threaded pin from KDAW 9995

3. Cleaning the Parts

The individual parts of the alternator should be cleaned only briefly with gasoline or trichloroethylene.

N2

4. Inspecting and Repairing the Parts

4.1 Testing the Rotor for Short-Circuit to Frame:

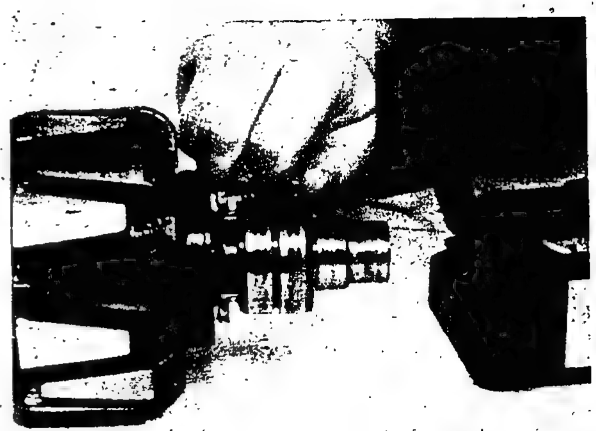
Test voltage:

28-V rotors	80 V AC
Rotors with nominal voltages over 42 V	600 V AC

Caution:
Observe safety regulations.

4.2

Measure the resistance of the excitation winding in the rotor with ohmmeter; see Section 7 for resistance values.

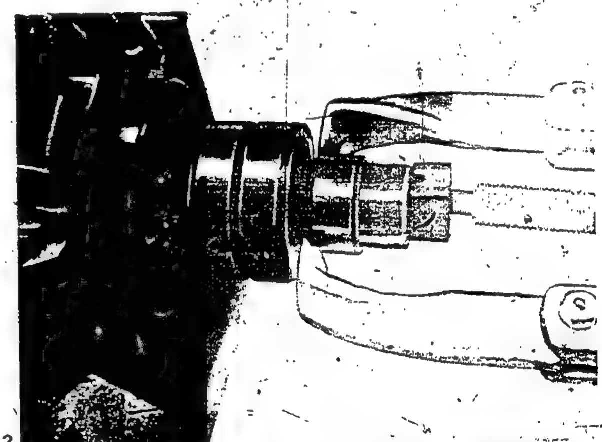

12

4.3 Collector Rings

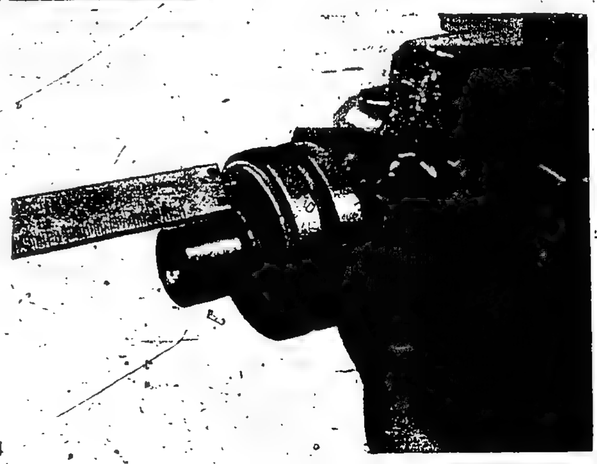
Note:
Model T2 alternators with screw-type diodes and a dual-heat-sink assembly have bonded collector rings, while Model T2 alternators with press-in diodes and a triple-heat-sink assembly have collector rings pressed into place. Model T1 alternators always have pressed-on collector rings.

4.3.1 Replacing Bonded Collector Rings

Clamp the rotor in the mounting device. Using a soldering gun or soldering iron, carefully unsolder the ends of the winding at the collector ring.
Using a puller, pull off the collector ring.
Clean the rotor axle and mark the collector ring seat with a center punch in several places so that the collector ring will not shift in position during the bonding process and while the bonding agent hardens.
Coat the axle at the collector ring seat and the inner side of the collector ring with VS 12641-Kk mixed with VS 12642 Ch (mixing ratio 1 : 1).


13

When the collector ring is replaced on the axle there must be a distance of 6.2 mm from the step on the rotor axle to the collector ring; in addition, care should be taken that the position of the connections is correct.
Solder the ends of the winding to the collector ring terminals and then coat the joints with bonding mixture.
Place the rotor in a heating furnace and let the bonding agent harden at 150 °C for 15 minutes, or let the bonding agent harden at room temperature for 24 hours.


14

N3

4.3.2 Replacing Pressed-on Collector Rings

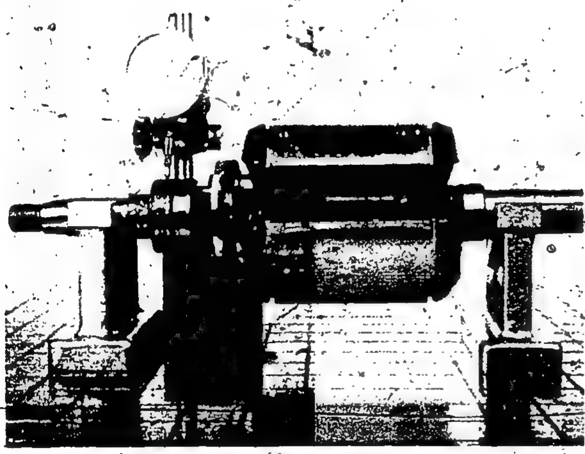
Unsolder the end of the winding at the collector ring using a soldering gun or soldering iron.
Pull off the track ring for the radial seal.

Caution:
Apply the puller at the extreme outer edge of the track ring so that the retainer is not pulled with the track ring because this would damage the rotor axle. Then pull the collector ring off the shaft.

Note:
Some collector rings can not be removed without difficulty. In such cases the rotor should be put on a lathe and the collector ring turned down to the rotor axle.

Place a new collector ring on the rotor axle and align the connections with the ends of the winding. Using an arbor press, press the collector ring onto the axle up to the stop.
When the connections have been soldered, the binding at the ends of the winding must be replaced if necessary. Goat the new binding as well as the soldered connection with VS 12642-Kk mixed with VS 12642-Ch (mixing ratio and hardening time same as with bonded collector rings). Then turn the collector ring on a lathe.

When turning collector rings on a lathe, a tailstock chuck (see Section 1) must be used.
Use a hard metal (Widia), ceramic, or diamond cutting tool.

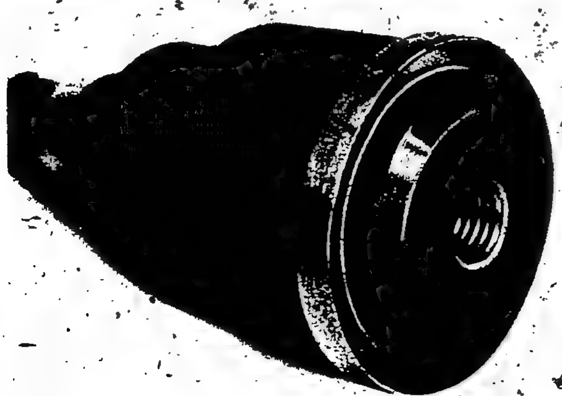


15

4.3.3
Check Runout

Slipring runout = max. 0.03 mm
Minimum diameter: 46 mm

Maximum permissible deviation for runout of the flywheel and laminated core = 0.05 mm.



16

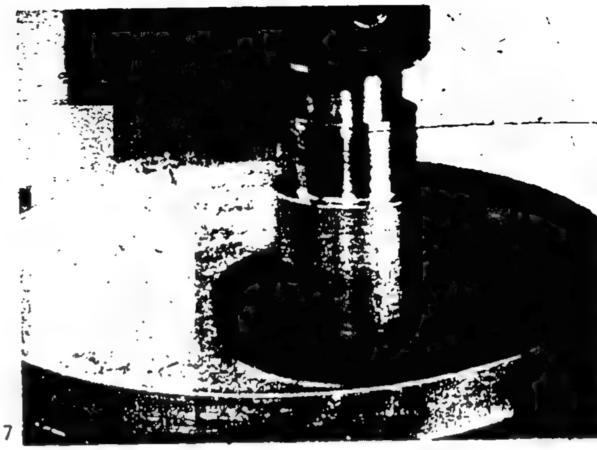
4.4 Drive End Shield

Remove the radial seal.
Slide a new seal onto the press-in tool and press it into the drive end shield using the arbor press.
Then grease the sealing lips well with Ft 1 v 34.
Grease the roller bearing seat lightly with Ft 70 v 1.

N4

4.5 Support Ring

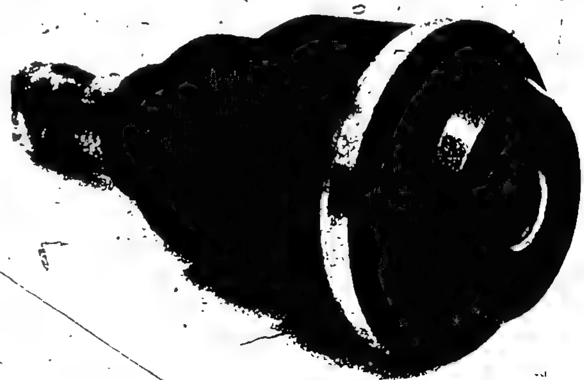
Remove the radial seal. Place a new seal on the press-in tool (see Fig. 18) and press it into the support ring using the arbor press. Then grease the sealing lips well with Ft 1 v 34.



17

4.6 Collector-Ring Housing

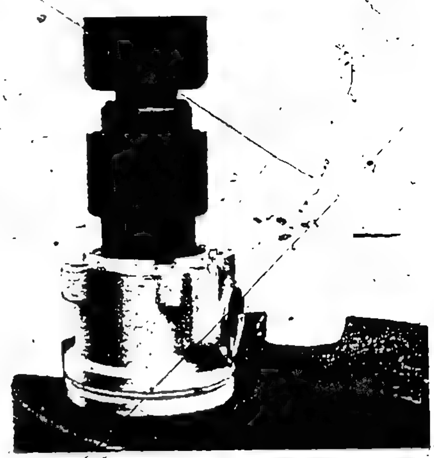
Press the old radial seal out using the press-out tool (make locally according to Fig. 35). Place a new radial seal on the press-in tool and . . .



18

. . . press it into the collector-ring housing using the arbor press. While doing this, support the housing with a section of pipe. Then grease the sealing lips well with Ft 1 v 34.
All radial seals are intended to seal against dust and are therefore to be installed in such a manner that excess grease can escape by way of the shaft.

Alternators with Cylindrical Roller Bearing
Use the press-in tool (make locally according to Fig. 37).



19

4.7 Stator Winding

4.7.1 Testing for Short-Circuit to Frame

Test voltage:	
28-V alternators	80 V AC
Alternators with rated voltages over 42 V	600 V AC

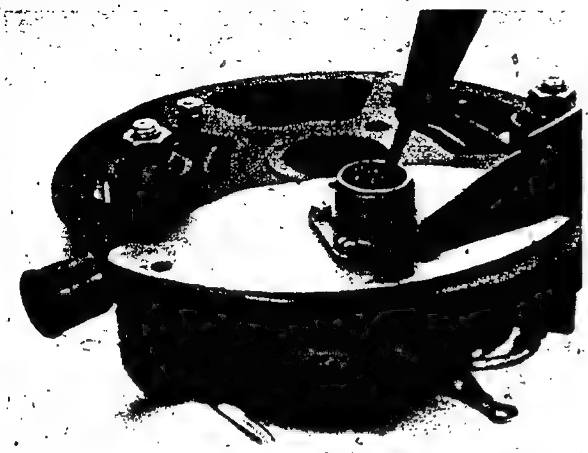
Caution:
Observe safety regulations.

4.7.2 Resistance

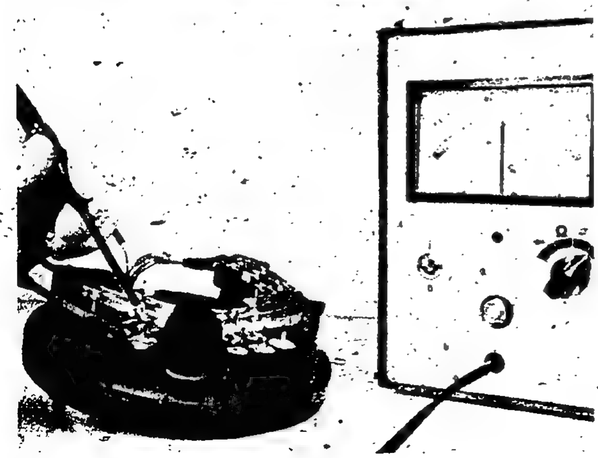
Measure the resistance between the phase outputs of the stator winding with an ohmmeter.
For resistance values see Section 7.

20

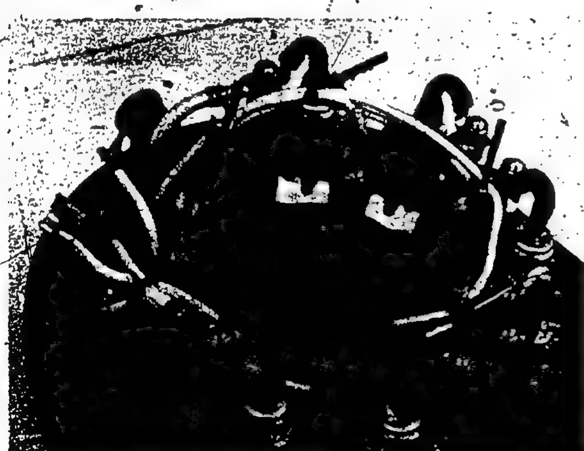
N5



21



22



23

4.8 Collector-Ring End Shield

4.8.1 Testing Six-Pin Plug for Short-Circuit to Frame

Test voltage 80 V AC

4.8.2 Continuity Test

Test for continuity between the Bendix plug and the joining bars using 6 V DC.
Continuity must exist between:
Terminal A and center joining bar
Terminal B and outside bar
Terminal C and line leading to brush holder
Terminal D) free
Terminal E) free
Terminal F and inner joining bar.

4.8.3 Individual Test of Press-in Diodes

Use Alternator Tester EFAW 192.
When press-in diodes are connected in parallel, an exact test is not possible without unsoldering at least one diode per group.
Observe operating instructions for the tester!
Maximum reverse current 0.8 mA.

4.8.4 Replacing Screw-Type Diodes

Unscrew defective diodes using box wrench SW 17.
Caution: Do not tilt the wrench!
Test heat sinks for short-circuit to frame;
test voltage: 80 V AC

Note:
Screw-type diodes 2 127 320 018, ..019 for T1 alternators have been changed. Press-in diodes in screw-type sockets are now being supplied under the same Part Nos.:
positive diode 2 127 320 018 with red color marking on the heat sink; and negative diode 2 127 320 019 with black color marking on the heat sink.

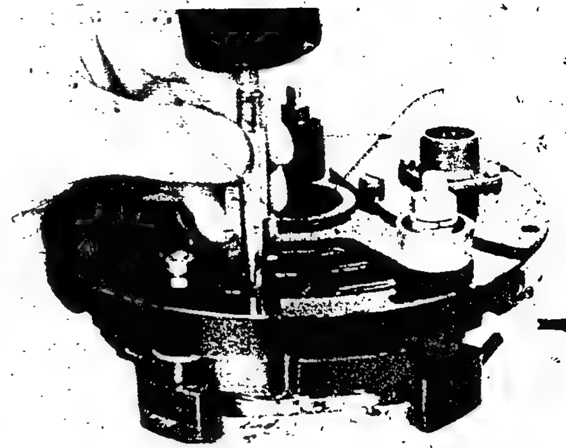
Screw-type diodes 2 127 320 036, ..037 for T2 alternators can no longer be supplied.
When these diodes have to be replaced, complete heat sinks with press-in diodes – positive heat sink D 120 600 630, negative heat sink D 120 600 631 – should be used.

Before new diodes are screwed into place, their seating surface must be coated with silicone oil Type 01 63 v 2.
Tightening torques:
for power diodes = 23 – 28 kgf.cm (2.3 – 2.8 Nm)
for exciter diodes = 13.5 – 17.5 kgf.cm (1.35 – 1.75 Nm).

Route the connection wires between the diodes neatly and bind them together with hemp cord at the points shown by the arrows.
Grease the roller bearing seats lightly with Ft 70 v 1.

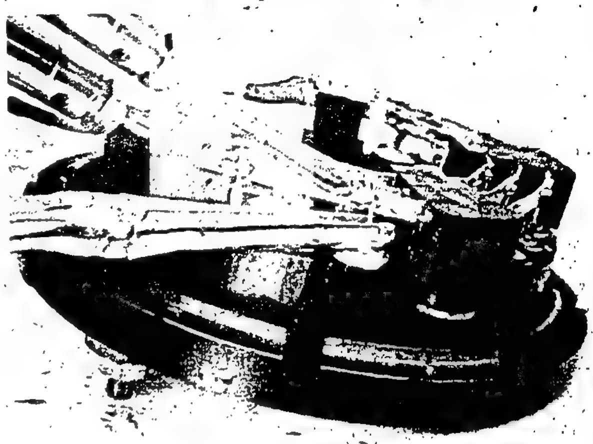
4.8.5 Replacing the Press-in Diodes

Unsolder the connection at the defective diode. While unsoldering this connection, open the clip on the joining bar with a pair of pointed-nose pliers.
Using a drift, drive the diode out from the other side.



24

Before pressing the new diode into place, coat the diode seat in the heat sink with silicone oil Type Ol 63 v 2.
Place the diode on the heat sink so that the diode connection lies in the clip.
Place the press-in mandrel in the proper position and press the diode carefully in.
Do not tilt the mandrel!
Test the diode according to Fig. 25 after it has been pressed into place.



Close the clip and solder the diode connection.
In order to conduct heat away during soldering, hold the connector lead at the diode with a pair of flat-nose pliers.

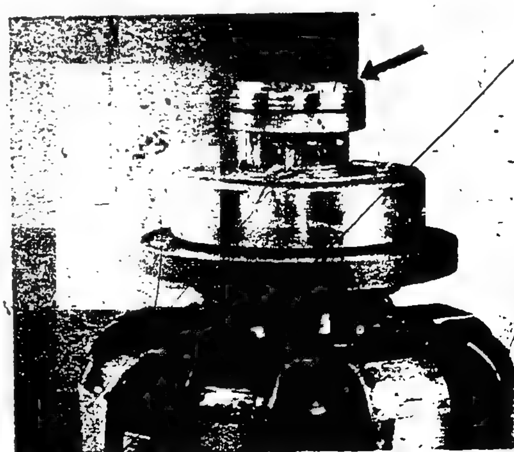
25

In order to protect the alternators against corrosion, all bare points on the collector-ring end shield — heat sinks, diodes, and joining bars — should be coated with moisture protection lacquer or with electric insulating spray.
The ball bearing seat should be greased with Ft 70 v 1.

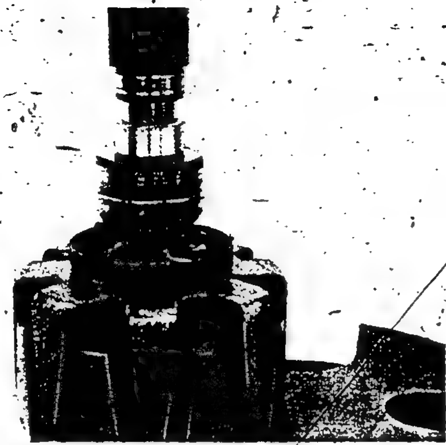
5. Assembly of the Alternator

Place the collector-ring side of the rotor on the arbor press. A suitable base must be provided.
Grease the ball bearing with Ft 1 v 34 before pressing it into place.

When pressing the intermediate ring into place be sure that the 20° chamfer is on top (see arrow).
A damaged intermediate ring (for example if scored) must be replaced.
Support the rotor on the drive side with a suitable base.
Place the collector ring housing in position, grease the ball bearing with Ft 1 v 34 before pressing it into the housing.
When pressing the ball bearing into place, use a suitable sleeve.



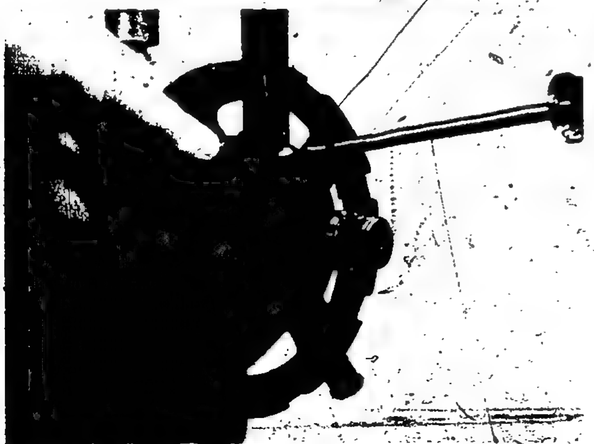
26



27

Alternators with cylindrical roller bearing

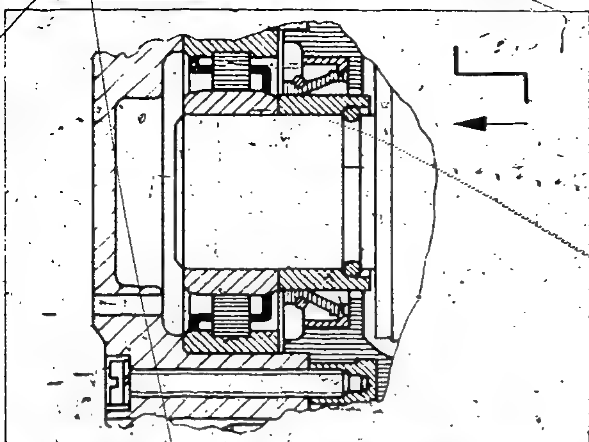
Slide the intermediate ring onto the rotor shaft until it is stopped by the retainer.
Press the cylindrical roller bearing inner ring onto the rotor shaft.



28

Clamp the rotor in the mounting device. Place the drive end shield in position and bolt it to the support ring. Be sure that the grease channel in the drive end shield and the recess in the support ring coincide.

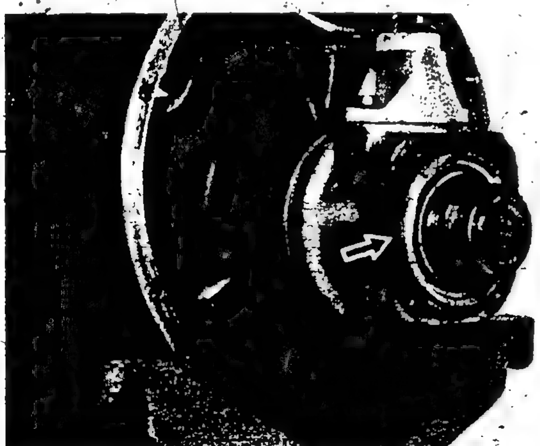
Coat the joints between the drive end shield and the support ring with Kk 1 v 3.



29

Alternators with cylindrical roller bearing

Press the cylindrical roller bearing into the collector-ring end shield.
Be sure that the position of the roller cage when assembled is correct.



30

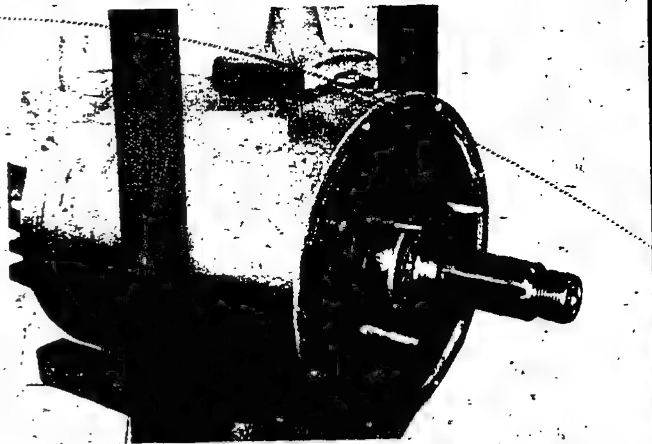
Alternators with external cooling

Check the carbon brushes for freedom of movement. Minimum length 12 mm.
Clamp the stator frame in the mounting device.
Introduce the rotor into the stator frame. Set the collector-ring housing in place and mount the brush holder.
Do not forget the seal (arrow).

Place the collector-ring end shield in proper position and bolt the collector-ring housing to it.

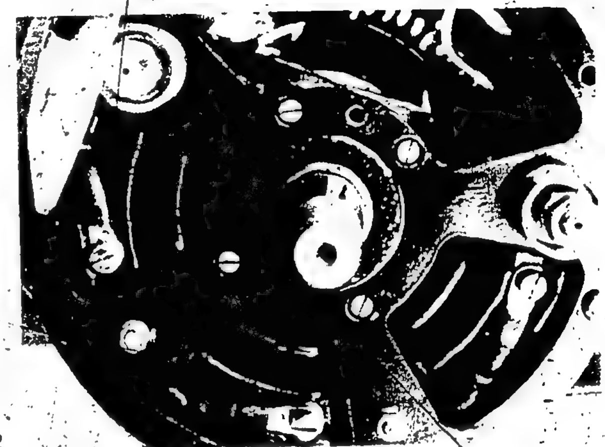
Connect the phase outputs and the wires leading to the carbon brushes.

Introduce the collector-ring end shield and rotor carefully into the stator frame and bolt the collector-ring end shield to the stator frame.



31

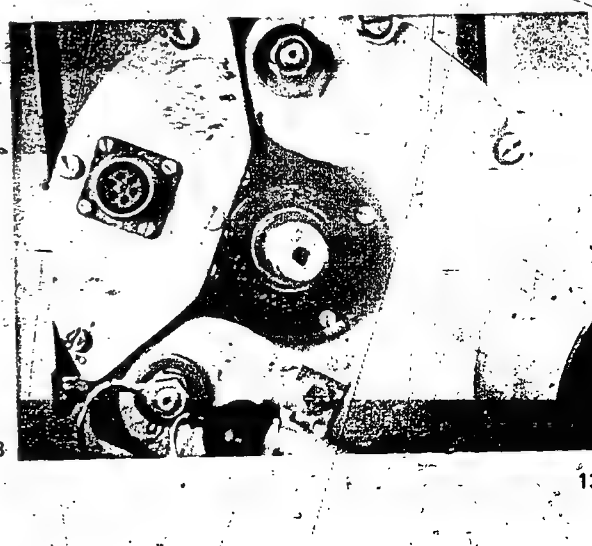
Alternators with internal cooling



32

Clamp the stator frame in the mounting device and fasten the collector-ring end shield loosely in place with 2 screws.
Be sure that the position of the collector-ring end shield is correct!
Screw the three stator outputs to the heat sinks.
Be sure, that the surfaces where the electric cables will be attached are absolutely clean and bare.
Place the seal on the contact surface for the collector-ring housing (see Fig. 30).
Introduce the rotor into the stator frame and fasten the collector-ring housing to the collector-ring end shield. When fastening the drive end shield in place be sure that the swivel arm is correctly positioned.
Check the carbon brushes for freedom of movement in their holders.
Minimum length of brushes 12 mm.
Mount the brush holders.
Use only brass nuts.

Fasten the connection plate in place, install and connect the transistor regulator. If provided, mount the suction cover and coupling catch in place.
Place the fan belt pulley on the shaft and tighten the fastening nut with a torque of 12 – 15 kgf.m (120 – 150 Nm). Test the capacitor, install it, and connect it.



33

6. Lubrication after Assembly

Turn the grease cups on the drive end and collector-ring end shields all the way in twice. Cups filled with Ft 1 v 34.

Also fit grease cups to the screw-sealed grease channels and force in two full cups of Ft 1 v 34.
Then replace the screw seals and tighten down well again.
Tighten the grease cup caps by hand well.

7. Technical Data

Collector ring runout	max, mm	0.03
Minimum length of carbon brushes	mm	12
Brush pressure	p (N)	450 – 550 (4.5 – 5.5)
Minimum diameter of collector rings	mm	46
Tightening torque for fan belt pulley nut	kgf.m (Nm)	12 – 15 (120 – 150)
Tightening torque for exciter diodes[1]) on type T1	kgf.cm (Nm)	13.5 – 17.5 (1.35 – 1.75)
Tightening torque for power diodes[1]) on type T1	kgf.cm (Nm)	23 – 28 (2.3 – 2.8)

Resistance values, ± 10 %

Stator[2])

apart from	T 1 (RL) 28 V 40 A 12	0.12 Ω
	T 1 (RL) 28 V 60 A 12	0.16 Ω
	T 1 (RL) 84 V 31 A 14	0.76 Ω
Rotor	T 1 (RL) 14 V 85 A 12	4.8 Ω
	T 1 (RL) 28 V 40 A 12	13.7 Ω
	T 1 (RL) 28 V 60 A 12	9.0 Ω
	T 1 (RL) 28 V 85 A 14	8.5 Ω
	T 1 (RL) 28 V 125 A 18	4.5 Ω
	T 1 (RL) 28 V 125 A 21	8.5 Ω
	T 1 (RL) 84 V 31 A 14	12.0 Ω
	T 2 (RL) 28 V 85 A 12	3.6 Ω
	T 2 (RL) 28 V 100 A 12	2.8 Ω

[1]) Only with screw-type diodes
[2]) Between the phase outputs

8. Testing the Alternator

The alternator is tested according to Test Instructions VDT-WPE 315/101 B.

Important:
Alternators with rated voltages over 40 V may only be tested on specially developed test benches!

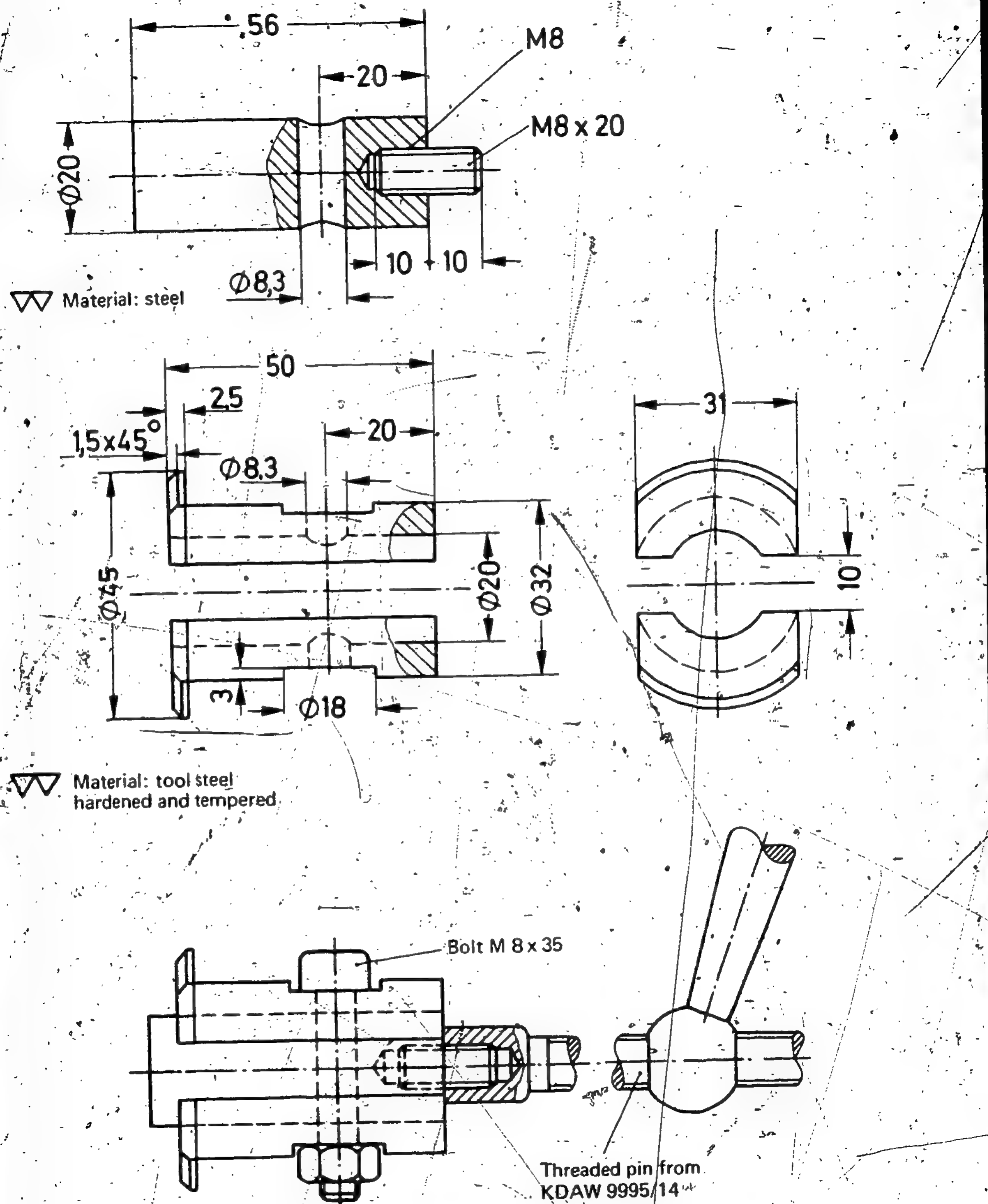
Caution – danger of accident:
Observe safety regulations – in Germany VDE safety regulations!

Test specifications are given in VDT-WPE 315/201 B.

The transistor regulator should be tested according to VDT-WPE 320/104 B and VDT-WPE 320/212 B, ../213 B.

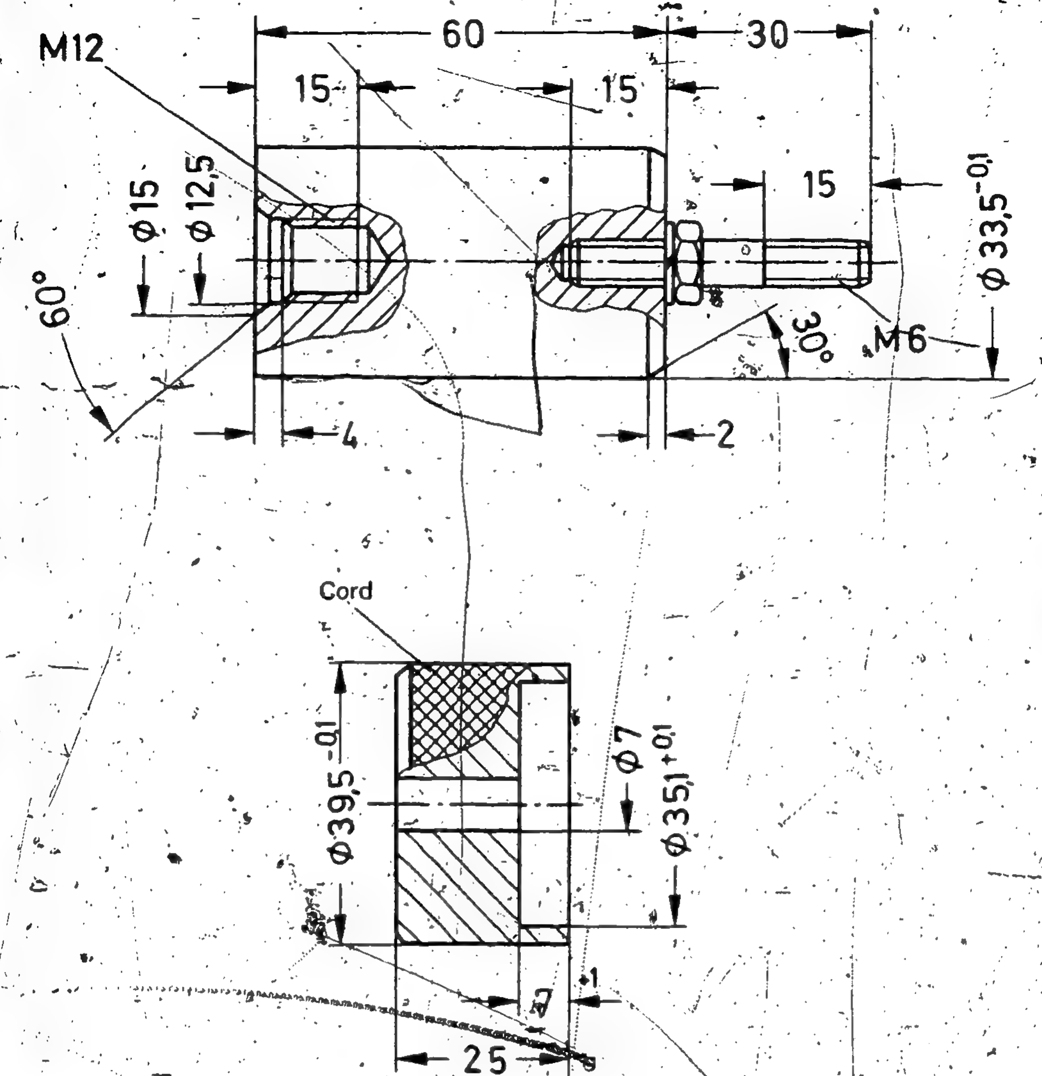
N10

Fig. 34


56
20
M8
M8 x 20
Ø20
10
10
Ø8,3
Material: steel
50
2,5
20
1,5x45°
Ø8,3
Ø45
Ø20
Ø32
3
Ø18
31
10
10
Material: tool steel
hardened and tempered
Bolt M 8 x 35
Threaded pin from
KDAW 9995/14

N11

Fig. 35


M12
60
30
15
15
15
ϕ15
ϕ12,5
60°
30°
M6
ϕ33,5-0,1
4
2
Cord
ϕ39,5-0,1
ϕ7
ϕ35,1+0,1
7
+1
25

W-120/100

Fig. 36

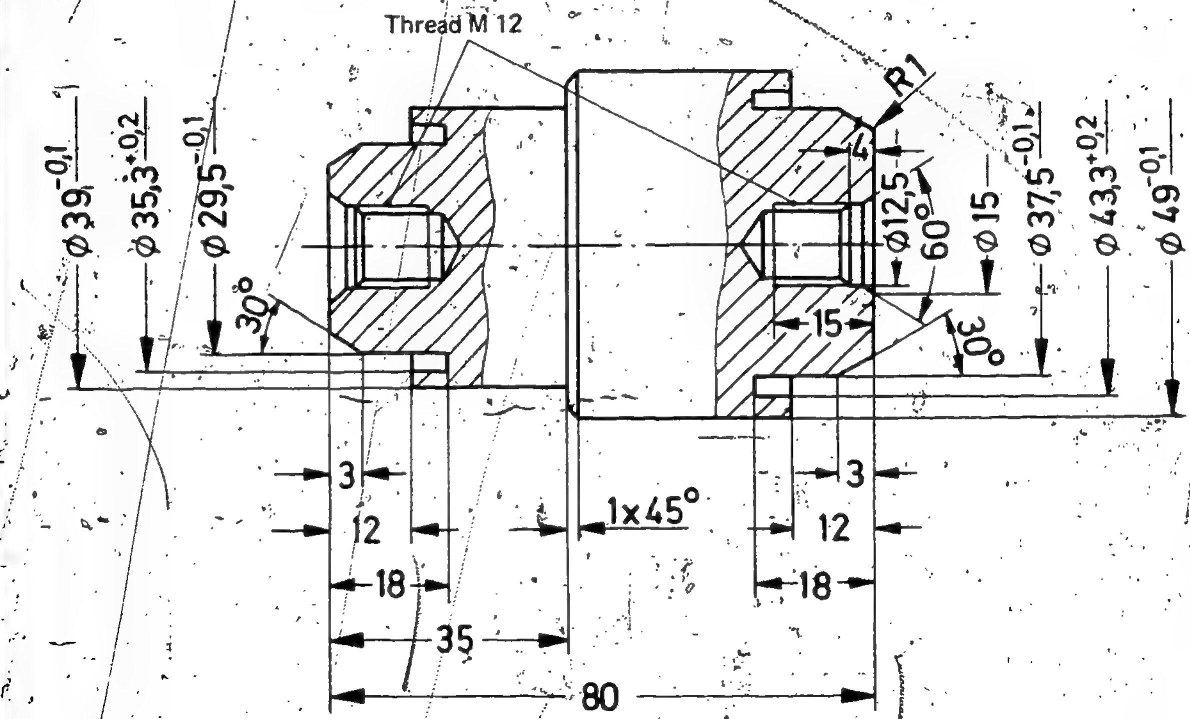
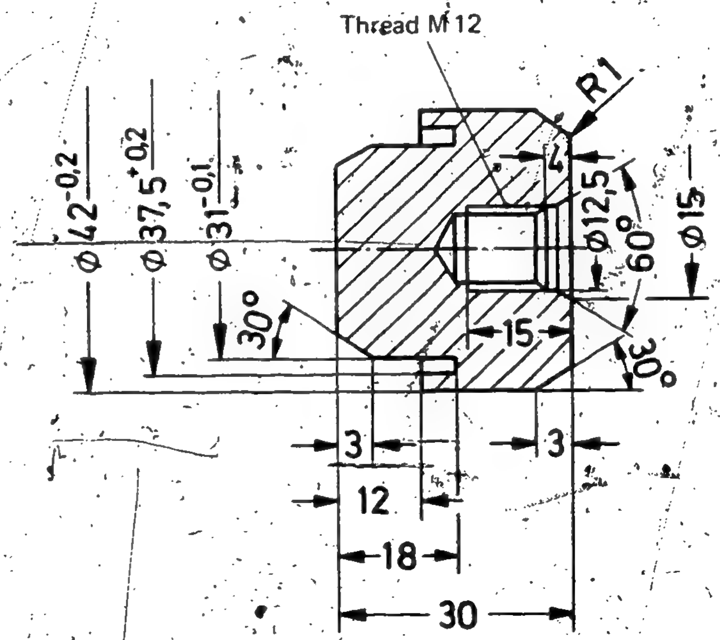
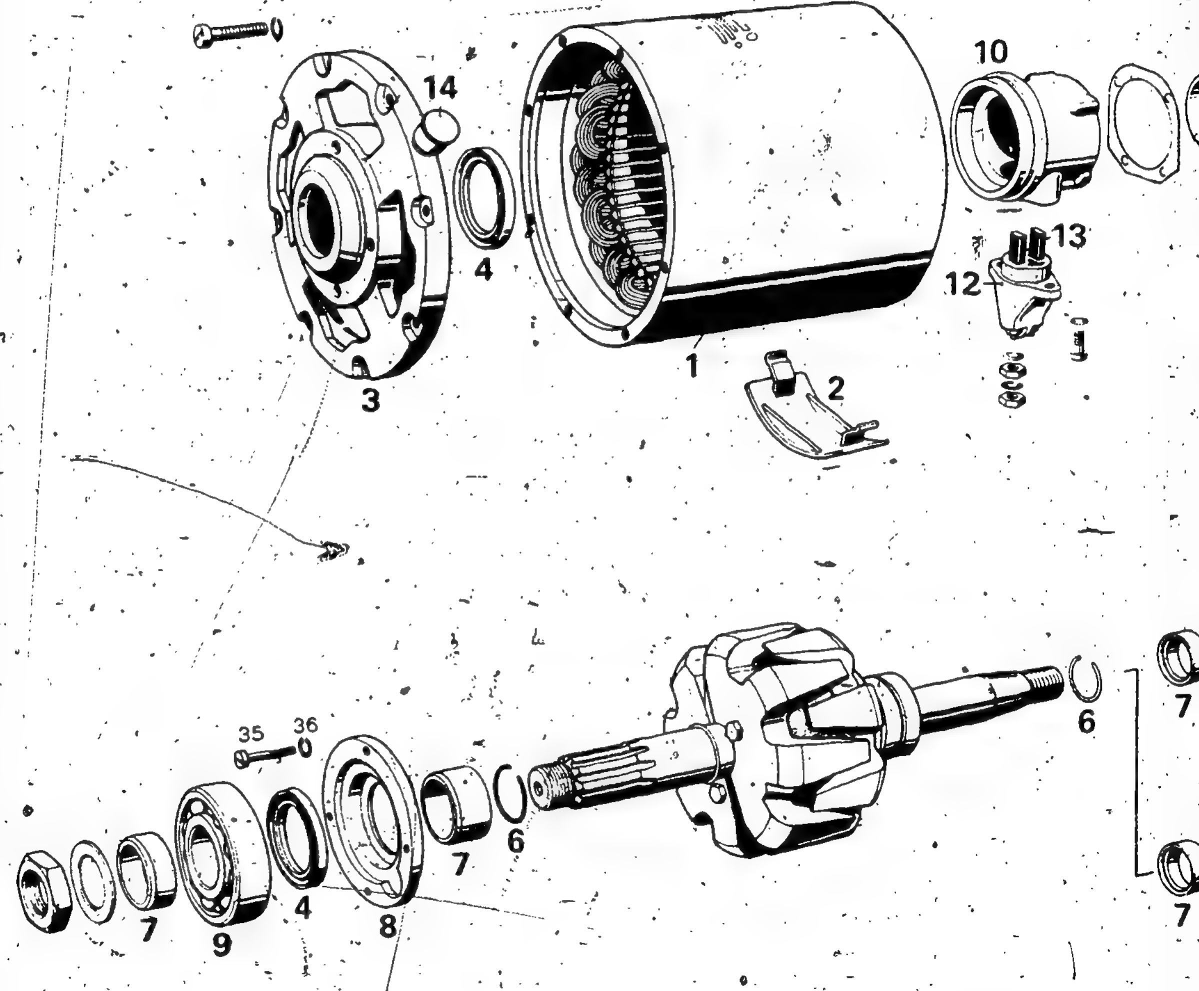


Fig. 37



N13

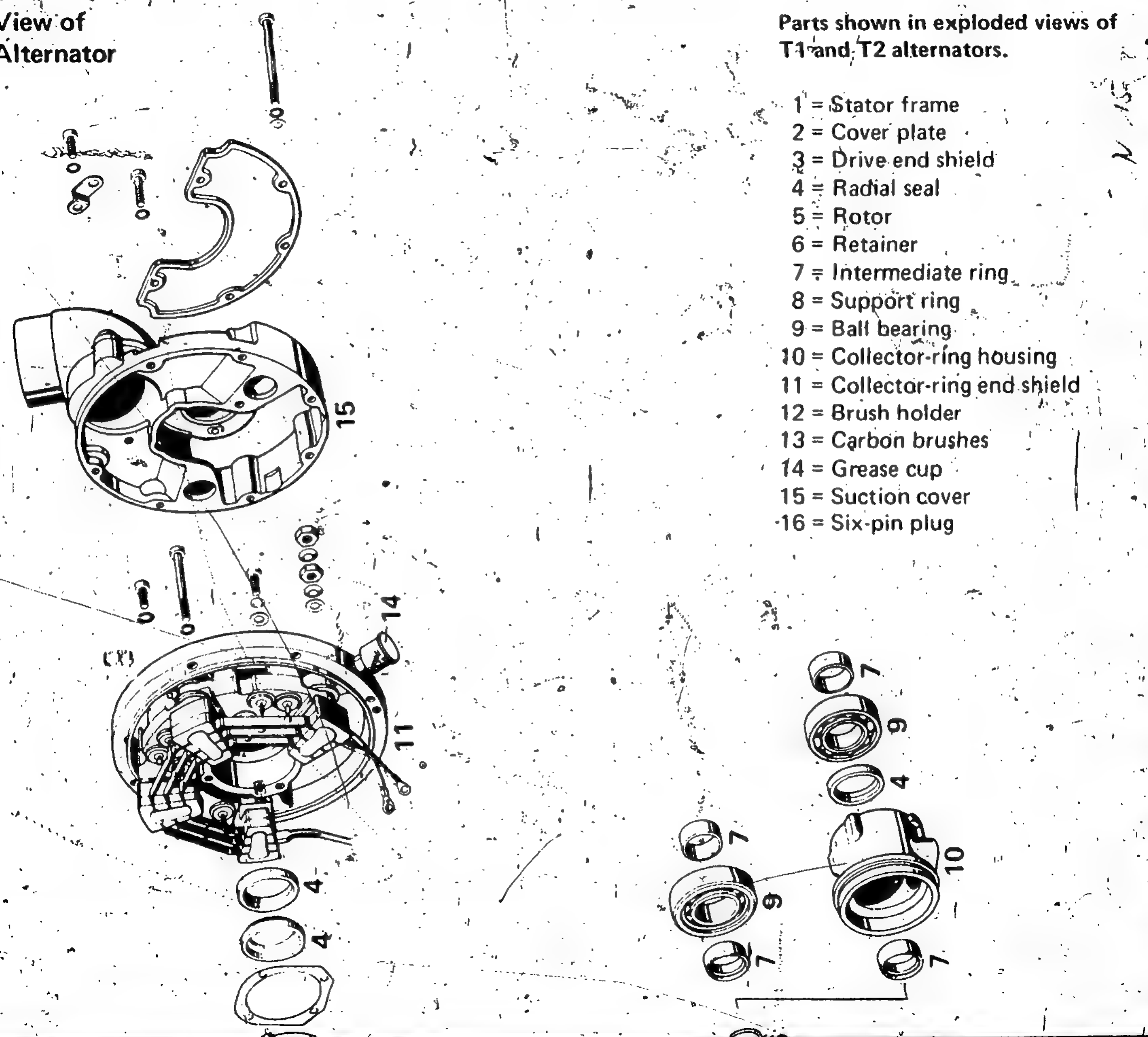
18



Seite 18

N14

Exploded View of Model T1 Alternator

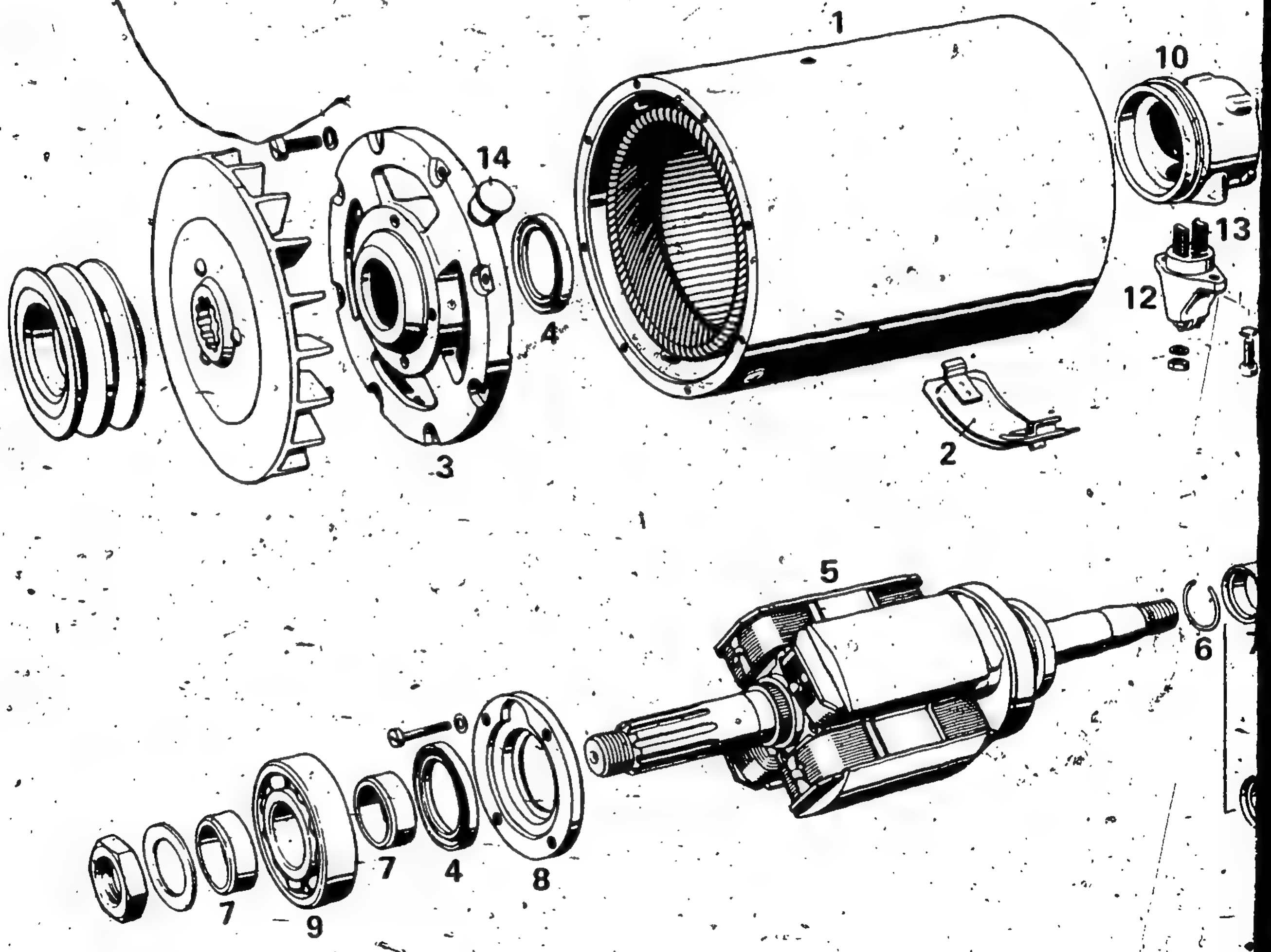


Parts shown in exploded views of T1 and T2 alternators.

1 = Stator frame
2 = Cover plate
3 = Drive end shield
4 = Radial seal
5 = Rotor
6 = Retainer
7 = Intermediate ring
8 = Support ring
9 = Ball bearing
10 = Collector-ring housing
11 = Collector-ring end shield
12 = Brush holder
13 = Carbon brushes
14 = Grease cup
15 = Suction cover
16 = Six-pin plug

N 15

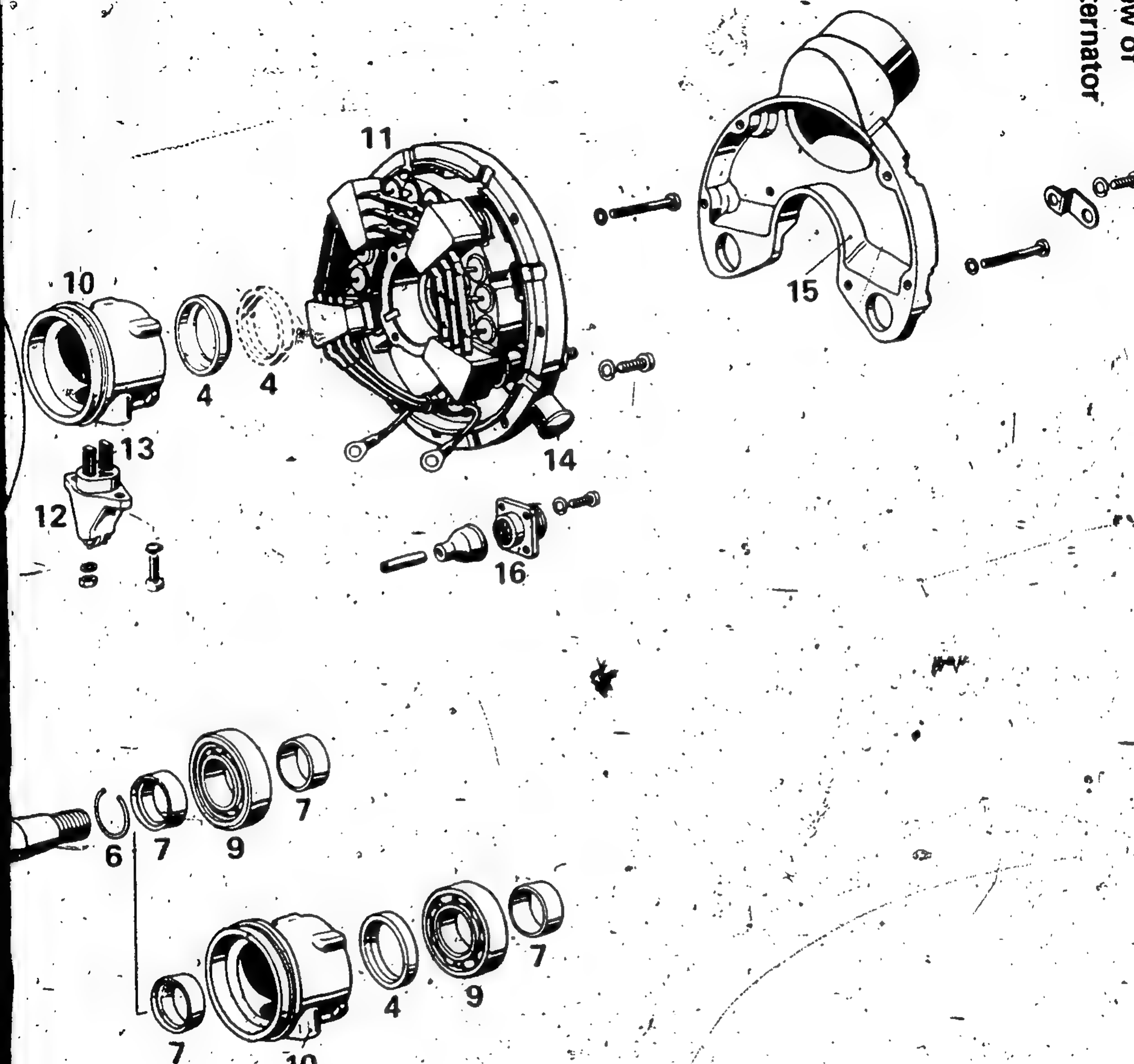
N15



N 16

Seite 20

Exploded View of
Model T2 Alternator



H-120/100

N 17.

Seite 21

N17

SERVICE-PART ORDERS FOR PILE-DRIVER IGNITER 0 203 400 001

Service parts for pile-driver igniter 0 203 400 001 will in future be supplied only by

FHN - Verbindungstechnik GmbH
Forther Hauptstraße 65
D-8501 Eckental - Forth
Telephone 09126 / 1790
Telex 62 38 74

Please send all service-part orders for the pile-driver igniter to this address.

Published by:
ROBERT BOSCH GMBH
Division KH
Technical After-Sales Service (KH/VKD 2)

Please direct questions and comments concerning the contents to our authorized representative in your country.

Technical Bulletin

BOSCH

Geschäftsbereich KH, Kundendienst Kraftfahrzeug-Ausrüstung.

N18

CAR ALARM PLUS 3 (wheel protection) VDT-I-335/113 En

CAR ALARM PLUS 4 (passenger-compartment protection) 5.1985

The leads from angle sensor and ultrasonic detector to the respective evaluation electronics may have a mutual effect on each other. Therefore, to prevent false alarms, they should not be laid together in the same wiring harness, but should be at least 100 mm apart.

For the same reason, it is also practical to keep these leads as short as possible.

Please direct questions and comments concerning the contents to our authorized representative in your country.

Technical Bulletin

BOSCH Geschäftsbereich KH. Kundendienst Kraftfahrzeug-Ausrüstung.

After-sales Service

Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party.

13...39

ACCIDENT DUE TO EXPLODING BATTERY

VDT-I-180/107 En

0 180 ..

4.1983

As a fault of the person involved and due to unprofessional handling, a serious accident arose whilst a starter battery was being fitted into a truck.

The driver, who was fitting the battery, suffered serious injuries to his face and will probably lose his eyesight.

Reconstructed sequence of events leading to the accident

With the battery cable disconnected and with the cell cap removed, the battery was charged in the cab of the vehicle. After charging the driver reconnected the terminals and tightened first of all the negative terminal with an adjustable open-end wrench. As he was tightening the positive terminal, the wrench slipped off the hexagon nut and came into contact with the ground connection (short circuit). The resulting spark formation caused an oxyhydrogen gas explosion. Flying splinters and sprayed acid hit the driver in his face and eyes.

This careless handling of batteries leads us to point out, once again, the following:

When a battery is charged, a dangerous explosive mixture of hydrogen and oxygen is formed (oxyhydrogen gas).
Battery rooms should therefore be well ventilated. Never work with a naked flame, create sparks or smoke near a battery or in a battery room. Remove the cell cap when the battery is being charged. Observe the installation instructions.

BOSCH Geschäftsbereich KH, Kundendienst, Kfz-Ausrüstung.
© by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50. Printed in the Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.

When fitting the battery connect first the positive cable, then the negative cable (in vehicles with negative to ground). When removing the battery, proceed in the opposite order (first negative, then positive). In this way the formation of sparks between the positive terminal and vehicle ground can be avoided when fitting the battery.

Always wear protective goggles when working on batteries.
Acid sprayed onto the skin or clothes should be washed off immediately with a lot of water.

Please inform your customers, e.g. filling stations, firms with vehicle fleets, vehicle representations and private customers about the procedure with batteries.